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THESIS

TO PROVIDE AID AND A POSSIBLE METHOD FOR DETERMINING THE PROBLEM UNITS IN ARITHMETIC OF THE SIMPLE SITUATIONS THAT CONNECT SUFFICIENTLY WITH CHILD EXPERIENCES TO INDICATE THEIR ACCEPTABLE USAGE.

Submitted by

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In partial fulfillment of requirements

for the degree of Master of Education.

- I93[illegible]

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I. The Problem

I. The aim in this study is to provide aid and a possible method for determining the problem units in arithmetic or simple situations that connect sufficiently with child experiences to indicate their acceptable usage. What experience does the child have on which to found the teaching of arithmetic or such units as the post office or grocery store? To what age or grade does the teaching of time belong? It is such questions as these that this study will attempt to investigate.

"The child understands and learns effectively only when work is properly adapted to his level of thinking."[1] And it may be added, 'that his background of experience is such as to give him understanding.' "Informal, experience-extending, concept-building work should replace formal drill entirely in grades one and two."[1]

"Arithmetic has been a prominent elementary school subject ever since it was introduced into the public schools of America, and it reflects, in a general way, the trend of thought of the leaders in the field of education."[2]

"In the primary grades a program of the "three R's is changing to one which carries meaning to children. The social

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1- A Course of Study in Arithmetic for Elementary Schools - Grades I-III, The Commonwealth of Massachusetts, Department of Education, page 6

2- Metter, Harry L.-Trends in the Emphasis on Various Topics of Arithmetic since 1860- The Elementary School Journal- Vol. XXXIV, June, 1934- page 767

organization is that of a community representing the social world as children see it and live it.--- With the activities of the social studies as a setting, the child's school life functions with more unity. The "three R's" take on meaning and reason for being."[1]

"Functional thinking begins in the kindergarten as is evidenced by the expressions - "She is so slow it will take her a long time", and "I need a long thread because I have a lot to sew". Readiness in arithmetic depends upon what we mean by arithmetic. "---Mathematical readiness seems to depend upon the experiences of the child, his maturity, and the nature of mathematics. Young children often exhibit remarkable evidence of readiness for mathematical thinking which involves basic concepts and principles, but not written computation."[2] The interest in the present study is in arithmetic readiness for problem units. Apparently experiences are the chief consideration in readiness for problem units.

Florence E. Reid of the University of Wyoming made a study of Incidental Number Situations in the First Grade. In reporting this study she says, "It is interesting and most significant to find that the concrete use of number at first grade level far exceeded the abstract use.--- The comments of the

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1- Reed, Mary M.-Planning a Social Studies Program for Young Children- Childhood Education-Vol.XIII-Oct.1936, page 59

2- Sueltz, Ben - Arithmetic Readiness and Curriculum Construction - The Mathematics Teacher, Oct.,1937 - page 200-202

children show that they are conscious of numbers and their function at first grade level."[1]

Woody of the University of Michigan made an investigation to ascertain the Arithmetical Backgrounds of Young Children. He found "that children possess much ability in the elementary process of arithmetic even before the time of beginning formal instruction in the subject."[2]

1- Reid, Florence E. -Incidental Number Situations in the First Grade.- Journal of Educational Research, Vol. XXX, September, 1936 - pp. 42, 43

2- Woody, Clifton - The Mathematical Backgrounds of Young Children - Journal of Educational Research, Vol. XXIV, October, 1931 - p.200

II. Need for Study of the Problem.

1. Few studies have thus far been made to determine the arithmetic concepts of young children. There is a need for a scientific basis in making the curriculum for the kindergarten and the first three grades, as for the upper grades.

Gillet, in an article on Foundations, says, "It is said that there are more failures in arithmetic than in any other subject in the middle grades. In many cases investigation shows the trouble started far back. Foundations were not made secure, but nobody examined them, and the inevitable occurred."[1]

2. There is also need of a scientific basis for placement of certain units, such as time, in the proper grade and at the proper age.

Florence E. Reid suggests "that further studies be made to determine what activities afford the most number situations and at the same time are a natural outgrowth of the child's environment."[2]

"The greater the degree of meaning in number, the more apparent must be its significance."[3]

1- Gillet, Harry O.- Foundations - Foundations in Arithmetic- Bulletin for the Association of American Childhood- p.3

2- Reid, Florence E.- Incidental Number Situations in First Grade- Journal of Educational Research, Vol.XXX-No.1 September, 1936 - p.43

3- Brownell, William A.- Trends in the Three R's- Childhood Education, Vol.XIII-No.9, May, 1937 - p.421

Helen White in her study says in the conclusion "that a larger percentage of children achieve the correct answers to a problem when the situation involved in that problem is based on the child's experiences."[1]

"There is a point in a child's mental growth before which it is not effective to teach a given process in arithmetic and after which that process can be taught reasonably and effectively."[2]

"There is a tendency to build the curriculum around the interests and needs of children. There is evidence of a more discriminating choice of units of work with due regard to all phases of child life."[3]

"Within the last few years there has been a decided trend toward eliminating abstract number content from the field of arithmetic in Grades I and II. In its place concrete arithmetic is taught, and the child is provided with a fund of rich number meanings and a wealth of number experiences."[4]

1- White, Helen M.- The Relation of an Understanding of the Situation Involved in a Problem and Success in its Solution- Unpublished Thesis at Boston University- 1935

2- Washburn, C.- Mental Age and the Arithmetic Curriculum- Journal of Educational Research-Vol.XXIV-March,1931-p.229

3- Harap, Henry-Trends in the Early Elementary Curriculum- Childhood Education- Vol.XIV-#2, Oct.1937- p.57

4- Gunderson, Agnes G.- Nature and Amount of Arithmetic in Readers for Grades I and II- Elementary School Journal- Vol.XXXVI-March,1936- p.527

William Brownell, writing on Readiness and the Arithmetic Curriculum, says, "The need is for a fundamental reorganization of instruction from the bottom up. To achieve such an instructional reorganization in arithmetic is a research program which can challenge the best efforts of all educators."[1]

3. In our progressive schools we teach by units. In what grade shall we teach certain units? Scientific investigations are needed for proper grade placement at the proper age.

Frank Rich says, "Most of the dislikes and antipathies of later years take their origin in forgotten incidents of early life. We should therefore take special precautions in these first experiences with mathematics to make sure that the habitual mind-set toward the subject is always "fair and warmer."[2]

Ned Russell writes in an article on Arithmetical Concepts of Children, "If we are to promote child mastery of arithmetic, then we must determine first of all what number-ideas children have, and in what situations children employ mathematical concepts."[3]

1- Brownell, William A. - Readiness and the Arithmetic Curriculum. Elementary School Journal-Vol.XXXVIII-January, 1938- p.321

2- Rich, Frank M.- Project Arithmetic- Small Numbers and Combinations- American Childhood-Vol.XX- No.2- October, 1934- p. 16

3- Russell, Ned - Arithmetical Concepts of the Child. - Journal of Educational Research- Vol.XXIX- No.9-May, 1936- p. 647

"Schools which attempt systematic arithmetic instruction at all in the primary grades commonly lay the major emphasis on the number combinations. This statement, taken by itself, seems to imply considerable agreement in these schools as to instructional practice. Such is, of course, not actually the case---- There are ways in which programs of primary number do not resemble each other. Two of these ways are: (1) failure to appreciate the difficulty of the combinations , and (2) failure to provide a sound basis of number knowledge prior to teaching the combinations."[1]

"Arithmetic cannot be justified in the primary grades unless it can be presented sensibly to the child, unless it can be learned by the child with interest and economy, and unless it can be shown to contribute to happier and more intelligent living on his part."[2]

In an article on Opportunities for the Use of Arithmetic in an Activity Program by Paul R. Hanna and others, it is stated in the summary that the authors "feel that a national survey of situations in which children find a need for arithmetic is highly

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1- Brownell, William A.- Teaching Meanings.

Foundations in Arithmetic- Bulletin for the Association of Childhood Education - 1937 - p.11

2- Ibid - p. 15

desirable. It is their belief that considerable inarticulation would be found between even the most modern arithmetic courses and the actual needs of pupils."[1]

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[1] Hanna, Paul R. and others - Opportunities for the Use of Arithmetic in an Activity Program-- The National Council of Teachers of Mathematics Tenth Yearbook- p. 118

III. Other Studies.

The 29th Year Book of the National Society for the Study of Education contains the report of an investigation made by Buckingham and MacLatchy on the Number Abilities of Young Children when they enter Grade One. They gave six tests to 1,356 children. The first two concerned counting, the next two number concepts, and the last two number combinations. From the results of these tests they found "that entering first grade children have a readiness for numbers, having already had such varied experiences that they are able to respond correctly to number situations of an elementary nature."[1]

Woody gave tests to children in the grade previous to that in which formal arithmetic began. His tests were given to Kindergarten, First and Second Grade children, the majority of the children tested being in the First Grade. In his conclusions he says, "(1) That children possess much ability in the elementary processes of arithmetic even before the time of beginning formal instruction in the subject; (2) that the knowledge possessed by children is not limited to counting and adding combinations but includes elementary knowledge of fractions, United States money, units of various types of measure, and the understanding of the processes demanded in simple verbal problems."[2]

1- Buckingham and MacLatchy- The Number Abilities of Children When They Enter Grade One- 29th Year Book- pp.473-525

2- Woody, Clifford- The Arithmetical Backgrounds of Young Children- Journal of Educational Research-Vol.XXIV-No.3- Oct.1931 p. 201

Ned Russell, of the University of Kansas, made a study to establish how large a quantity with which children can deal. The results led him to conclude that "the child's first concept of number is a manyness from which the quality and serial aspects of number differentiate---the cardinal and ordinal numbers' concept develop simultaneously---The child can compare groups of blocks up to 10 with remarkable accuracy although he has a visual notion of only three or perhaps four--- the seven-year old child will form sub-groups first which have unequal value mathematically.---It is not likely that the first or second grade pupils will be mature enough to master completely and understand isolated addition and subtraction facts. Formal work such as drill over these arithmetic facts should be discouraged. The observation indicates that the initial training in arithmetic should be undertaken with the use of concrete materials."[1]

Miss Graham, in her study on "The Best Time to Begin Arithmetic" tested children from the Kindergarten through the six grades by giving a questionnaire similar to the one used in this study. In her summary, she says that "It is proved beyond a doubt that a correct response in a drill example does not indicate a correct number concept. Drill in Grades I and II does not bring number concepts. Therefore drill is less important with young children than a concept of number or understanding of

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1-Russell, Ned M.-"Arithmetical Concepts of Children." Journal of Educational Research- Vol. XXIX- No.9- May, 1936- pp. 662-663

number in his own experiences. We take many experiences for granted. Problems about prices and how we buy and sell mean little before Third Grade."[1]

Elizabeth Quattlander made a study of unit work in second grade as opposed to formal arithmetic. Miss Quattlander and her class had a most interesting experience through a second grade unit in Arithmetic. The children kept account books of money received and money spent. Some of the children were so interested that they continued the expense books through the summer. Her results were so satisfactory that she concluded- "Informational units in arithmetic may well replace systematic drill in Second Grade."[2]

Miss Harris made a study to help establish an experience basis for arithmetic problems. She gave a test similar to the one used in this study to children from the Kindergarten through the 9th grade. The test was given individually.

In her conclusion she says that the "experiences of the children are governed by local usages", and that "problems should

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1- Graham, Mattie - The Best Time to Begin Arithmetic.
A term paper at Boston University - 1933

2- Quattlander, Elizabeth - Replacing Systematic Drill with
Informational Units in Second Grade.
Unpublished Thesis at Boston University - 1935.

be based on experiences prevalent in the locality."[1]

Miss White, in 1932, previously quoted, made a study on "The Relations of an Understanding of the Situations Involved in a Problem and Success in its Solution". She says, "From the gross results of this study, the following conclusions may be drawn:-

(1) That a larger percentage of children select the right process in solving arithmetic problems when the situation involved in that problem is based on child experience.

(2) That a larger percentage of children achieve the correct answer to a problem when the situation involved in that problem is based on the child's experiences."[2]

Miss Elizabeth Ray, writing on Arithmetic Readiness, used a similar questionnaire to the one used in this study, testing kindergarten and primary grades. Her results were much the same as found in this study. In her conclusion she says, "Only very simple arithmetic such as counting and informational units

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1- Harris, Emma Frances- To Help Establish an Experience Basis for Arithmetic Problems- A term paper at Boston University- 1934

2- White, Helen Mildred- The Relation of an Understanding of the Situations Involved in a Problem and Success in its Solution - Thesis at Boston University - 1932.

should be attempted in the Kindergarten and Primary Grades."[1] This study shows that only very minor aspects of arithmetic can be presented and understood.

Miss Olive Mahoney taught arithmetic in her first grade through informational units. In reporting on it she says, "The first grade teacher can lay a foundation of understanding and interpretation of number situations by utilization of the experiences the children are having and have had. The ease with which the children themselves attacked their little business problems, the pleasure and satisfaction derived from their ever accurate results, and the interest and enthusiasm with which they went on to each new activity assures the author that a foundation of understanding and appreciation has been laid ----The informational unit growing out of the actual experience of the children does lend itself in reality to the number interests of first grade children."[2]

1- Fay, Elizabeth - Arithmetic Readiness in the Kindergarten and Primary Grades. Unpublished Thesis at Boston University, 1938

2- Mahoney, Olive G.- Extending First Grade Experiences. Unpublished Masters Thesis at Boston University - 1938

IV. The Questionnaire.

1. In the present study the questionnaire method was used. The questions were chosen after careful examination of studies previously made, particularly those by Woody, Buckingham and MacLatchy, Miss Harris, Miss White, and Miss Graham. Miss Helen Gorham made a similar study in 1937, using the same set of questions as used in this study. The results of her work are included later in this thesis. An attempt was made to cover as many as possible of the experiences of children at the Kindergarten, First, Second, and Third Grade levels. The questionnaire is included as Exhibit I, pages 16 and 17.

The questionnaire is composed of twenty questions, many of which have from two to four parts, making in all 78 items. Each question is related to an experience that might involve arithmetic situations which seem to be common to all children at this level. We all buy food and clothing. We mail letters. We live by time. We use money. These and similar experiences were included in the questionnaire.

2. The test was given to each child individually without a time limit. The answers were recorded by the examiner, all questions and answers being given orally. The child was allowed time to answer. When he did not seem to be able to answer, the next question was asked. The children were urged not to guess but to say "I do not know." Many of the children did not answer at all when they did not know. The children were free to talk or ask questions of the examiner if the meaning of the question was not clear. No score was given for the test, but each ques-

tion was evaluated by itself.

3. The test was given during the months of February, March, and April of 1937, and to a small group of kindergarten children the last part of March in 1938.

The children were for the most part of the middle class, the parents of whom are far from rich, and live in that part of the town away from the center. The children seem protected. It was too far for them to be sent to the store alone.

The children chosen were those from the kindergarten through the first three grades. There were two classes to each grade. The number of boys and girls happened to be about equal. The number of children in a grade was about 20, except in one third grade where there were 11 children. This was a slow-moving group and had some over-aged children in it. A table showing the grades and sex of the children is included as Table I, page 18.

EXHIBIT I.

Showing The Questionnaire Used as a Basis for this Study.

1. a) Do you go shopping?
   b) What do you buy?
   c) How much does it cost?

2. a) How much is a loaf of bread?
   b) How much is an ice-cream cone?
   c) How much is a lollipop?
   d) How much is a small Hershey bar?

3. a) What does Mother pay for butter?
   b) What does Mother pay for eggs?
   c) What does Father pay for the gas for the car?

4. a) How much milk is in a big bottle?
   b) What does a bottle of milk cost?

5. a) Did you ever buy a stamp in the post-office?
   b) How much does it cost to send a letter to Boston?
   c) How much does it cost to send a letter here in Bridgewater (own town)?

6. a) How much does the daily paper cost?
   b) How much does the Sunday paper cost?

7. What is this coin?
   Show a) a cent; b) a nickel; c) a dime; d) a quarter; and e) a half dollar.

8. Count this money-- a) 10 cents; b) 5 nickels; c) 10 dimes.

9. a) How many nickels in a dime?
   b) How many dimes in a dollar?
   c) How many quarters in a dollar?
   d) How many cents in a quarter?

10. a) Can you count?
    b) Count to 100 by 1.
    c) Count to 100 by 10.
    d) Count to 100 by 5.

11. Count these objects--20 marbles.

12. a) Give me 3 marbles.
    b) Give me 7 marbles.
    c) Give me 5 marbles.
    d) Give me 8 marbles.
    e) Give me 10 marbles.
    f) Give me 1 marble.
    g) Give me 4 marbles.

13. a) Can you read numbers?
    b) Read these numbers - 1,3,5,7,8, 12, 14, 29, 36, 45, 84.

14. a) Where do you find numbers to read?
    b) How can you tell what day this is?
    c) Find today on the calendar.

15. a) How do you know the time?
    b) What time does school begin?
    c) What time do you eat dinner?
    d) Find the time you eat supper.
    e) Find the time school begins.
    f) What time is this:- 9:00; 12:00; 3:30?

16. a) What month is your birthday?
    b) What month and day is your birthday?
    c) How old are you?
    d) How old is your brother (or sister)?

17. a) How tall are you?
    b) How can you find out?

18. a) Which is larger- a whole apple or a half an apple?
    b) Which is larger- a half an apple or a quarter of an apple?
    c) Which is larger- a pint or a quart?
    d) Which is larger- an inch or a yard?

19. a) When you cut an apple in half, how many pieces are there?
    b) When you cut an apple in quarters, how many pieces are there?

20. a) Do you earn money for working?
    b) Tell me about it.

TABLE I.

NUMBER OF CHILDREN BY GRADE, ROOM, AND SEX.

GRADE	BOYS		GIRLS		BOTH	
Kindergarten						
1937	6		16		22	
1938	11		9		20	
Totals		17		25		42
First Grade						
Room 1	14		5		19	
Room 2	9		10		19	
Totals		23		15		38
Second Grade						
Room 3	8		12		20	
Room 4	12		6		18	
Totals		20		18		38
Third Grade						
Room 5	12		9		21	
Room 6	6		5		11	
Totals		18		14		32
Totals tested		78		72		150

Table I gives the number of children tested by grade, room, and sex. The Kindergarten, 1927, had 6 boys and 16 girls, making 22 children. The Kindergarten, 1928, had 11 boys and 9 girls, making 20 children. In both Kindergartens there were 17 boys and 25 girls, making 42 children in the grade.

The first grade, Room 1, had 14 boys and 5 girls, making 19 children. The first grade, Room 2, had 9 boys and 10 girls, making 19 children. There were 23 boys and 15 girls, making 38 children in the grade.

The second grade, Room 3, had 8 boys and 12 girls,making 20 children. The second grade, Room 4, had 12 boys and 6 girls, making 18 children. There were 20 boys and 18 girls, making 38 children in the grade.

The third grade, Room 5, had 12 boys and 9 girls, making 21 children. The third grade, Room 6, had 6 boys and 5 girls, making 11 children. There were 18 boys and 14 girls, making 32 children in the grade.

There were 78 boys and 72 girls tested, making a total of 150 children tested.

The number of children, boys and girls in each room, is about the same as well as the number of children in each room and grade. In the total there were only 6 more boys tested than girls.

Table II, page 20, gives the age, grade, and sex of the children tested. In looking at the table it will be seen that only a few of the children were 9 years old or over, and that they were for the most part of normal age for the grade.

TABLE II.

Showing ages of children tested by grade, room, and sex.

Ages	Kindergarten				Grade I				Grade II				Grade III				Total		
	*1937		1938		R.1		R.2		R.3		R.4		R.5		R.6				
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	Both
11^6-11^{11}																1		1	1
11^0-11^5																1		1	1
10^6-10^{11}																			
10^0-10^5																			
9^6-9^{11}													1	1	2	2	3	3	6
9^0-9^5											1			1		1	1	2	3
8^6-8^{11}									1	5	1		7	5	3		12	10	22
8^0-8^5									2	3	3	1	4	2	1		10	6	16
7^6-7^{11}					3				4	2	3	2					10	4	14
7^0-7^5					2	1	4	1	1	1	3	3					10	6	16
6^6-6^{11}					4	2	3	4		1	1						8	7	15
6^0-6^5					4	2	2	5									6	7	13
5^6-5^{11}	2	8	10	7	1												13	15	28
5^0-5^5	4	8	1	2													5	10	15
Total Children	6	16	11	9	14	5	9	10	8	12	12	6	12	9	6	5			150

* R - Room

B - Boys

G - Girls

The ages range from 5 years in the Kindergarten through 11^6 years in the third grade.

The Kindergarten children were all either 5 or 5^6 years old. In the Kindergarten, 1937, 4 boys were 5 years old, 8 girls were 5 years old, 2 boys were 5^6 years old and 8 girls were 5^6 years old. There were 12 children 5 years old and 10 children 5^6 years old. In the Kindergarten, 1938, 1 boy was 5 years old and 2 girls were 5 years old, 10 boys were 5^6 years old and 7 girls were 5^6 years old. There were 3 children 5 years old and 17 5^6 years old.

In the first grade the ages ranged from 5^6 years through 7^6 years. In Room 1, 4 boys and 2 girls were 6 years old; 4 boys and 2 girls were 6^6 years old; 2 boys and 1 girl were 7 years old; and 3 boys were 7^6 years old. In the first grade, Room 2, 2 boys and 5 girls were 6 years old; 3 boys and 4 girls were 6^6 years old; and 4 boys and 1 girl were 7 years old.

The second grade ages ranged from 6^6 years through 9 years. In Room 3, 1 girl was 6^6 years old, 1 boy and 1 girl were 7 years old, 4 boys and 2 girls were 7^6 years old, 2 boys and 3 girls were 8 years old, and 1 boy and 5 girls were 8^6 years old. In the second grade, Room 4, 1 boy was 6^6 years old, 3 boys and 3 girls were 7 years old, 3 boys and 2 girls were 7^6 years old, 3 boys and 1 girl were 8 years old, 1 boy was 8^6, and 1 boy was 9 years old.

The third grade ages ranged from 8 through 11 years. In Room 5, 4 boys and 3 girls were 8 years old, 7 boys and 5 girls were 8^6 years old, 1 girl was 9 years old, and 1 boy and 1 girl

were 9^6 years old. In Room 6, 1 boy was 8 years old, 3 boys were 8^6 years old, 1 girl was 9 years old, 1 girl was 11 years old, and 1 girl was 11^6 years old.

Of all the children tested, 5 boys and 10 girls, or 15 children were 5 to 5^5 years old; 13 boys and 15 girls or 28 children were 5^6 to 5^{11} years old; 6 boys and 7 girls or 13 children were 6 to 6^5 years old; 10 boys and 6 girls or 16 children were 6^6 to 6^{11} years old; 10 boys and 6 girls or 16 children were 7 to 7^5 years old; 10 boys and 4 girls or 14 children were 7^6 to 7^{11} years old; 10 boys and 6 girls or 16 children were 8 to 8^5 years old; 12 boys and 10 girls or 22 children were 8^6 to 8^{11} years old; 1 boy and 2 girls or 3 children were 9 to 9^5 years old; 3 boys and 3 girls or 6 children were 9^6 to 9^{11} years old; 1 girl was 11 to 11^5 years old; and 1 girl was 11^6 to 11^{11} years old. It will be seen that the ages of the children are average for the Kindergarten, first, second, and third grades.

V. Results Discussed.

The first step in determining the results of the test was to go through all the papers question by question, recording all answers to each question and classifying them by sex, age, grade, and room. Each item received separate treatment. The per cent of each item was recorded under right, wrong, no answer, or under possible, impossible, no answer, depending upon the question itself.

For example, in Question 5b-"How much does it cost to send a letter to Boston?" - the answer was either right, wrong, or the child did not answer. But in Question 2a-"How much is a loaf of bread?" - the answer was possible, impossible, or there was no answer given. The price of a stamp is stable; the price of bread varies according to locality and the size of the loaf.

Each of the 78 items of the 20 questions in the questionnaire was tabulated in a form similar to that shown in Exhibit II, page 24. Each table has a summary at the bottom, showing percentages of answers right, wrong, or no answer, as previously explained.

Exhibit II shows the answers of all the children by grade, room, sex, and age to the questions on time, questions 15a b-c-d-f- on the questionnaire as given in Exhibit I, pages 16 and 17. This is a photostatic copy of the original table as made by tabulating the results of the individual responses. Exhibit II is read as follows: To the question (15a) "How do you know time?" 1 boy from the ages of 5 years through 5^5 years told time by the watch, 2 by the clock, and 1 boy gave no answer. Of the boys

Exhibit

Showing answers to the question on time as given by all the children by room, grade and age.

	Kindergarten 1937		Kindergarten 1938		Grade I Room 1		Grade I Room 2		Grade II Room 3		Grade II Room 4		Grade III Room 5		Grade III Room 6	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls								
14a How know time																
Watch	1															
clock	2 2	7 4	1 8	2 2	1 3 2 1 2	1 1	2 3 4	3 4 1	1 3 2 1	1 2 2 5	1 3 3 3 1	2 2 1	4 7 1	2 5 1	1 2 2	1 2 1 1
hands on K[illegible]						1										
by hands									1	1	1			1		
by sun															1	
ask			1	1				1								
look in house								1								
2 o'clock				1												
count No.					1											
learn		1														
No ans.	1	1 3	1	3	1 2 1	1 1				1		1				
% right	83	69	52	45	64	60	100	80	88	83	92	83	[illegible]	89	83	100
% wrong		6	9	21	7			20	12	9	8	9		11	17	
% No ans.	17	25	9	29	29	40				8		8	17			
15b School time																
right		1	1	1	2 2	1 1	1 1 3	2 2	3 1 1	1 1 2 1 4	3 1 3 1 1	2 1 1	4 5 1	2 4	1 3 2	2 1 1
1 o'clock			1	1												
3 o'clock	1				1	1	1	1								
4 o'clock								1								
6 o'clock					1											
8 o'clock		1 2			1 1 1				1				1			
8:30		1														
9:30												1				
10 o'clock														1		
12 o'clock						1			1							
after breakfast		1														
after 9:00							1									
In a year					1											
No ans.	3 2	4 6	9	1 6	1 1 2	1	1 1	2 1 1	1	2 1	1 2	1	1	1 1		1
% right	17	6	9	11	29	40	55	40	62	75	75	66	83	66	100	80
% wrong	83	32	9	11	42	40	23	30	26			17	9	22		
[illegible]		62	82	78	29	20	22	40	12	25	25	17	8	12		20
16c dinner time																
right	2	4 2	1	1 2	1 4 2 1	1 2	2 3 2	2 2	1 2 2 1	1 1 1 2 6	1 3 2 3 1 1	2 1	4 6 1	2 4 1	1 3 2	1 2 1 1
1 o'clock	1	1							1							
2 o'clock					1											
5 o'clock		1	1													
6 o'clock				1												
8 o'clock		1														
8:30								2								
9 o'clock	1															
9:30									1							
11 o'clock	1						1	1								
11 o'clock					1	1										
11:30								1								
12 45														1		
no ans	1	3 4	9	1 4	2 2	1	1	1 1		1	1	1 1 1		1		
% right	33	37	9	33	57	60	78	40	75	92	92	50	100	78	100	100
% wrong	50	19	9	11	14	20	11	40	25					11		
% no ans	17	44	82	56	29	20	11	20		8	9	50		11		
16d Find supper time																
right	1 2	1 2	2		1	2 1	1 1 1	1 3	1 2 1	1 3	2 2 1 1	1 1 1	4 4 1	2 2 1	1 2 1	1 2 1
wrong	1	3 3	1	1	3 2 2 1		1 2 2	4 1	1 1 1	1 1 1 2 2	1 1 1 2 1	1 1	3	2	1 1	1
no ans.	2	4 3	1 7	1 7	1 2 2	2	1	1	1	1		1		1 1		
% right	60	19	18		7	60	33	40	50	33	50	50	75	56	67	80
% wrong	17	39	9	11	57		56	50	37	58	50	33	25	22	83	20
% no ans	33	42	63	89	36	40	11	10	13	9		17		22		
15e Find school time																
right	1	1			1		1 1	2	3 1 1	1 1 3	1 1 2 1	1 2	4 3 1	2 1	1 2 1	2 1
wrong	1 1	3 3	2	2	1 3 2 2 2	1 1 1	1 2 2	4 2	1 1 1	1 1 1 1	1 2 1 1	1 1	4	3 1	1 1	1
no ans.	2 1	4 5	1 8	2	2 1	1 1	1 1	1 1		2 1	2	1		1 1		1
% right	17	7			7		22	20	62	92	42	50	67	33	67	60
% wrong	33	37	18	22	71	60	66	60	38	33	42	33	33	45	33	20
% no ans.	50	56	82	78	22	40	23	20		25	16	17		22		20
15f What time [illegible]																
right	1 2	1 2		1 3	1 1 1	1	1 1 1	1 3	1 3 1	1 2 1 3	1 2 1 1	2 1	4 7	2 3	1 3 2	1 2 1 1
wrong	1	5 1	1	1 3	1 2 1 1	1	1 1	4	1 1	2 2	2 1 2 1		1	1 1		
no ans	2	2 5	1 9	2	1 2 1 2	1 1 1	1 1 2	1 1	1	1	1	1 1 1		1 1		
% right	50	19		45	21	20	33	40	62	58	42	50	92	55	100	100
% wrong	17	37	9	33	36	20	22	40	35	33	50		8	23		
% no ans	33	44	91	22	43	60	45	20	13	9	8	50		22		
What time [illegible]																
right	2	1		1	1 2 1	1 1	1 2 3	2 3 1	1 4 1	1 2 3 3	2 1 2 1 1	2 2 1	4 7 1	2 4 1	1 2 2	1 2 1 1
wrong	2	5 5	1	2 5	1 1 1 1	1		2 1	1	1 1	2 1					
no ans	2	2 3	1 9	1	2 2 1 1	1 1	1 1 1	1	1	1	1 1	1		1 1	1	
% right	33	6		11	29	40	67	60	75	75	58	53	100	78	83	100
% wrong	34	62	9	78	29	20		30	13	17	25					
% no ans	33	32	91	11	42	40	33	10	12	8	17	17		22	17	
What time 3:3[illegible]																
right	1				1 1	1	1 1 1	1	1 1	2	1	1	4 7	2 2	1 1 1	1
wrong	2 1	3 2	1 1	1 2	1 3 1 2 2	1 1	1 2 1	2 3 1	3 1	2 2 2	1 2 1 1 1 1	1 1 1	1	2 1	1 1	1 1
no ans	2	5 6	9	1 5	2 1	1 1	2	2 1	1 1	1 1 1 1	1 2 1	2		1 1	1	1 1
% right	17				14	20	33	10	25	11	9	11	92	45	50	20
% wrong	50	31	9	33	64	40	45	60	60	50	58	50	8	33	33	40
% no ans	33	69	91	67	22	40	22	30	25	33	83	33		22	17	40

through the ages of $5^6 - 5^{11}$ two told time by the clock, etc. Then at the bottom of this section is shown the percentages of right answers, wrong answers, or no answer. Under question 15a on time, there were 6 responses, 83% (5 correct) and 17% (1) no answer.

Study of the other sections of Exhibit II will reveal similar treatment.

There follows herewith a discussion of the children's answers to the various items of the questionnaire (See Exhibit I, pages 16 and 17.)

Beginning with Question 1a-"Did you ever go shopping?"-it was found that 75% of the Kindergarten, 83% of Grade One, 79% of Grade Two, and 90% of Grade Three went shopping. Upon questioning the Kindergarten, First Grade, and most of Grade Two and Three it was found that they were usually accompanied by their mothers, or older brothers or sisters. A few took notes to the storekeeper; almost no child carried money unless it was the correct amount. Some third grade children did take enough so that they received change.

Question 1b - "What did you buy?"- Children said they purchased bread, butter, apples , balls, books, meat, clothes, newspapers, food of all kinds, and one child said he bought a goat. The cost of these articles was as varied as the articles themselves. The goat was 85¢; one child said a loaf of bread was 85¢. It was interesting to note that the prices were not given by many children. 79% of the Kindergarten did not try to answer. Out of the 16% giving the price of bread only 4% gave

reasonable answers. 14 different prices were given for bread.

Table III- A list of articles children said that they purchased in answer to Question 1b.

alleys
airplane
apples
bread
ball
butter
brown sugar
beans
blouse
books
bacon
bananas
candy
candy-bars
canned chicken
canned corn
canned milk
canned tomatoes
cabbage
cake
cat food (and dog)
cloth
clothes
carrots

cookies
coffee
cereals
cheese
Christmas presents
Easter presents
eggs
life-savers
Flash-light
fish
fruit
goat
gingercake
groceries
handkerchief
hamburg
ice-cream
ice-cream cone
junket
jam
meat
maple syrup
milk

oranges
ovaltine
potatoes
plates
pineapple juice
rolls
soup
soap
spaghetti
spool of thread
sugar
shoes
ties
toys
tea
things for doll
things to eat
things
wax paper
Wheaties
yeast cake
lots of stuff
newspaper

Question 2a asked the price of a loaf of bread. 19 different answers were given; the price ranged from 3¢ to 95¢. Only 5% of the Kindergarten gave a reasonable answer, 19% of the First Grade, 25% of the Second, and 63% of the Third Grade. The responses to this question are found under Tables IV and V, pages 27 and

Table IV-Showing children's various answers on the price of a loaf of bread.

Price of Loaf of Bread	Kindergarten 1937	Kindergarten 1938	Grade I R.1	Grade I R.2	Grade II R.3	Grade II R.4	Grade III R.5	Grade III R.6	Total
3¢	1	1							2
5¢		1	1			2			4
nickel			1						1
6¢		1						1	2
8¢						2	1		3
reasonable answers									
9¢					6			1	7
10¢		2		2	4	1	2	4	15
dime			2	1					3
11¢			1	1	1	1	2	2	8
12¢				1		1	9		11
15¢			1			2		1	4
18¢								1	1
20¢		1							1
25¢				1			2	1	4
quarter		1	1						2
35¢						1			1
85¢	1								1
95¢	1								1
2 pieces of money				1					1
Do not pay						1			1
No answers	19	13	12	12	9	7	5	0	77
Totals	22	20	19	19	20	18	21	11	150
No reasonable answers	0	2	3	5	11	3	13	7	44

Table IV shows the various answers given by the children for a loaf of bread according to Grade and Room. All the answers are recorded under price of loaf; the answers are set down by Grade and Room. The total number of children giving an answer is recorded as well as the number of children in each room. The number of children giving no answer is also recorded, after the last answer to the price of a loaf of bread. The reasonable answers are found between the parallel lines including 9¢ through 12¢. The number of reasonable answers for each room is given at the bottom of the table.

In looking at this table we find that two children said a loaf of bread cost 3¢, four children said it cost 5¢, one child said it cost a nickel, two said 6¢, three said 8¢, four children said 15¢, one said 18¢, and one said 20¢. Four said 25¢ and two said a quarter. One said 35¢, one 85¢ and one 95¢. One second grade child said two pieces of money, and another "do not pay". 77, or a little over half the children tested did not attempt an answer. 29 children, or about 1/5, gave unreasonable answers, and 44, or about 3/10, gave reasonable answers. Of the children giving reasonable answers, two were in the Kindergarten, 8 in the first grade, 14 in the second, and 20 in the third grade. Thirty-two in the Kindergarten, twenty-four in the first grade, sixteen in the second grade, and five in the third grade did not attempt to answer.

Bread is one of the most common of all commodities, yet only 44 children out of the 150 knew the price. Even in the third grade only a few over half of the grade knew what bread costs. It

is true that few of the children went to the store alone, and these without money.

A study of Table IV and Table V, which follows, strongly suggests a real opportunity for the schools. Bread is one of the commonest of commodities, and buying bread a task so simple that second and third grade children should easily perform it, possibly also first grade children. Yet the home does little or nothing about it. How can the school help; and if it does help, will the experience of buying bread be a worthwhile and meaningful experience that will contribute to number meanings? This is the line of thinking which the writer has been doing, and its restatement here helps to clarify the purpose of the study. What experiences have children had? What meanings have they derived? For the schools, what is the next step?

Table V.- Shows range of prices of bread and % of answers for each price according to each grade.

Price	Kindergarten	Grade I	Grade II	Grade III
3¢	5%			
5¢	3%	3%	6%	
nickel		3%		
6¢	3%			5%
8¢			8%	
Reasonable answers				
9¢			13%	7%
10¢	5%	5%	13%	19%
dime		8%		
11¢		5%	5%	14%
12¢		3%	3%	23%
15¢		3%	6%	5%
18¢				5%
20¢	3%			
25¢		3%		10%
quarter	3%	3%		
35¢			3%	
85¢	3%			
95¢	3%			
2 pieces of money		3%		
Do not pay			3%	
No answer	72%	64%	40%	12%
% Reasonable Answers	5%	17%	35%	63%

Table V shows the range of prices of bread and the percent of the answers for each price given by grades. The results come directly from Table IV. The explanation which follows involves some duplication therefore.

The price of bread ranged from 3¢ to 95¢. The answers were also given "do not pay" and "two pieces of money."

The price of bread was considered reasonable from 9¢ to 12¢ inclusive. As far as could be determined these were the prices of bread at all stores in town at the time of testing. The parallel lines enclose the accepted reasonable answers.

In the Kindergarten 5% of the children said bread was 3¢, 3% said it was 5¢, and 3% said it was 6¢. 3% said it was 20¢, 3% a quarter, 3% said 85¢ and 3% said 95¢. 72% did not attempt to answer. 5% gave reasonable answers.

In the first grade 3% said bread was 5¢, 3% said a nickel, 3% said 15¢ 3% said 25¢, 3% said a quarter, and 3% said "two pieces of money". 64% did not attempt to answer. 17% gave the reasonable answers; 5% said 10¢, 8% said a dime, 5% said 11¢ and 3% said 12¢.

In the second grade 6% said 5¢, 8% said 8¢, 6% said 15¢, 3% said 35¢, and 3% said "do not pay". 40% did not attempt to answer. 35% gave reasonable answers. 13% said 9¢, 13% said 10¢, 5% said 11¢, and 3% said 12¢.

In the third grade 5% said 6¢, 5% said 18¢, 10% said 25¢, and 13% did not attempt to answer. 63% gave reasonable answers. 3% said 9¢, 19% said 10¢, 14% said 11¢, and 23% said 12¢.

This table indicates that even in the third grade less than 3/4 of the children knew the price of one of the most common commodities.

Question 2b-- The price of an ice-cream cone was more within their experience. 62% of the Kindergarten were right ; 83% of the First Grade, 82% of the Second Grade, and 86% of the Third Grade were right. The answers by grade and room are given

given in Table VI below.

Table VI--Showing the range of answers given for price of an ice-cream cone by room and grade.

Price	Kindergarten 1937	Kindergarten 1938	Grade I R.1	Grade I R.2	Grade II R.3	Grade II R.4	Grade III R.5	Grade III R.6	Total
2¢	1					1			2
Right									
5¢	3	4	5	12	12	14	14	9	73
nickel	8	9	11	5	3	2	2	1	41
6¢		1							1
9¢		1							1
10¢	1	1	1		1		4	1	9
dime			1		1				2
half dollar		1	1						2
No ans.	9	3		2	3	1	1		19
Total tested	22	20	19	19	20	18	21	11	150
Right (nickel 5¢)	11	13	16	17	15	16	16	10	114

Table VI shows the range of answers given for the price of an ice-cream cone by room and grade. The price went from 2¢ to half a dollar. 5¢ and a nickel were correct. These are indicated on the table as right. 1 child in the 1937 Kindergarten and 1 child in the second grade, Room 4, said an ice-cream cone cost 2¢; 1 child in the 1938 Kindergarten said 6¢ and 1 child said 9¢. 1 child in the 1937 Kindergarten, 1 child in the 1938 Kindergarten, 1 child in the first grade, Room 1, 1 child in the second grade, Room 3, 4 children in the third grade, Room 5, and 1 child in the third grade, Room 6, a total of 9 children said 10¢ for an ice-cream cone. 1 child in the first grade, Room 1,

and 1 child in the second grade, Room 4, a total of 2 children said a dime. 1 child in the 1938 Kindergarten and 1 child in the first grade, Room 1, a total of 2 children said half a dollar. 9 children in the 1937 Kindergarten, 3 children in the 1938 Kindergarten, 2 children in the first grade, Room 2, 3 children in the second grade, Room 3, 1 child in the third grade, Room 5, a total of 19 children gave no answer.

3 children in the 1937 Kindergarten, 4 children in the 1938 Kindergarten, 5 children in the first grade, Room 1, 12 children in the first grade, Room 2, 12 children in the second grade, Room 3, 14 children in the second grade, Room 4, 14 children in the third grade, Room 5, and 9 children in the third grade, Room 6, a total of 73 children said 5¢. 8 children in the 1937 Kindergarten, 9 children in the 1938 Kindergarten, 11 children in the first grade, Room 1, 5 children in the first grade, Room 2, 3 children in the second grade, Room 3, 2 children in the second grade, Room 4, 2 children in the third grade , Room 5, and 1 child in the third grade, Room 6, a total of 41 children said a nickel.

Combining the right answers (a nickel and 5¢) and comparing them with the total tested in each room, there were 11 children in the 1937 Kindergarten or half the children right, 13 of the children in the 1938 Kindergarten or more than half of the children were right. 16 of the first grade, Room 1, or almost all of the children were right; 17 of the first grade,Room 2, or almost all of the children were right; 15 in the second grade, Room 3, or 3/4 of the children were right; 16 in the second

grade, Room 4, or almost all of the children were right. 16 in the third grade, Room 5, or about 4/5 of the children were right; 10 in the third grade, Room 6, or almost all of the children were right.

Of the 150 tested, 114 were right, or 76% of the whole number tested. More children knew the price of an ice-cream cone than knew the price of bread, butter, or milk.

Question 2c-- Again the cost of a lollipop was familiar to the children. 45% of the Kindergarten, 89% of the First Grade, 81% of the Second Grade, and 95% of the Third Grade were right.

Question 2d-- The cost of a small Hershey bar-- 18% of the Kindergarten, 38% of the First Grade, 42% of the Second Grade, and 48% of the Third Grade were right.

Question 3a--"What does Mother pay for butter?"--the price goes from 6¢ to $1.00 No one in the Kindergarten or the First Grade had a reasonable answer, and only 7% of the Second Grade and 25% of the Third Grade were able to give a reasonable answer. 21% gave wrong answers, and 79% no answers in the Kindergarten; 25% of the First Grade gave unreasonable answers and 75% no answers; 22% of the Second Grade gave unreasonable answers and 71% no answer; 45% of the answers in the Third Grade were unreasonable and 34% gave no answer.

In answering Question 3b- "What does Mother pay for eggs?" the children did better. The price of eggs varied from 6¢ to $1.00 a dozen. No one in the Kindergarten or First Grade gave a reasonable answer; only 26% of the Second Grade and 12% of the Third Grade gave reasonable answers. 9% of the Kindergarten chil-

dren owned hens; 50% gave no answer. 10% of the children in Grade I owned hens; 59% gave no answer. 11% of Grade II owned hens; 41% gave no answer. 11% of the Third Grade owned hens ; 31% gave no answer.

Question 3c--"What does Father pay for gas?"--2 children in Kindergarten had a reasonable answer; no child in First Grade, 2 in the Second Grade and 5 in the Third Grade gave reasonable answers. 33% of all the children had no car; yet out of those having a car (67%) only 6% of all the children or 9% of those owning a car knew the price of gas.

Question 4a--"How much milk in a big bottle of milk?"--Most of the Kindergarten did not attempt the answer (71%) and only 19% were right; a little over half (58%) of the First Grade did not answer and 25% were right; 41% of the Second Grade and 49% of the Third Grade were right while 47% of the Second Grade and 15% of the Third Grade did not answer.

Question 4b--"What does a bottle of milk cost?"--The answers here, as in the cost of bread and butter, show that the price of a common commodity means nothing to the children. The Kindergarten gave no reasonable answers. 15% of the First Grade, 8% of the Second, and 27% of the Third Grade gave reasonable answers; but 84% of the Kindergarten gave no answers, and 16% of the Kindergarten answers were unreasonable. 58% of Grade I gave no answer and 25% were unreasonable. In the Second Grade 60% gave no answer and 32% were unreasonable. In the Third Grade only 25% gave no answer and 51% were unreasonable.

Tables VII, VIII, and IX show the percent of the possible,

impossible, and no answers to Questions 2, 3, and 4b by grades. These tables are on pages 36, 39, and 41 respectively.

Table VII.- Showing % of possible or right answers to Questions 2, 3, and 4b by grades.

Article	Kindergarten	Grade I	Grade II	Grade III	Total
Bread	5%	19%	25%	63%	28%
Ice-Cream Cone	62%	83%	82%	82%	79%
Lollipop	43%	89%	81%	95%	78%
Small Hershey Bar	18%	28%	42%	50%	37%
Butter	0%	0%	7%	25%	8%
Eggs	0%	0%	26%	42%	17%
Gas for Car	2%	0%	3%	16%	5%
Milk	0%	15%	8%	27%	13%

Table VII shows the percent of the possible right answers to Questions 2, 3, and 4b. These questions ask the price of a loaf of bread, and an ice-cream cone, a lollipop, a small Hershey bar, butter, eggs, and milk. The percents of possible answers are given to each article by grade. The total percent is also given.

In looking at Table VII it will be seen that only 5% of the Kindergarten, 19% of the First Grade, 25% of the Second Grade, and 63% of the Third Grade gave possible answers, and only 28% of all tested gave a possible answer. Bread is the one thing that all families have almost every meal, yet only 28% of the children gave a possible answer.

Almost as many children in the Kindergarten knew the price of an ice-cream cone (62%) as in the Third Grade knew the cost of a loaf of bread (63%). 83% of the First Grade, 82% of the Second Grade, and 86% of the Third Grade gave correct answers on the price of an ice-cream cone. 79% of all the children knew what to pay for an ice-cream cone. This would seem to be the article they buy most, and they themselves handle the money.

The answers to the lollipop did not stand as high. In the Kindergarten 45% were right, 89% in the First Grade, 81% in the Second Grade, and 95% in the Third Grade. The total percent of all grades (78%) was only 1% less than for the ice-cream cone. Here again it would seem that the children were given money to buy a lollipop.

There was a decided drop in the right answers given for a small Hershey bar. 18% in the Kindergarten, 38% in the First Grade, 42% in the Second Grade, and 48% in the Third Grade were right. The percent for all of the children right was 37%. Not so many children bought this small Hershey bar as a lollipop or an ice-cream cone. This does not show up in the answers recorded, but came out during conversation.

However, the ice-cream cone, lollipop, and small Hershey bar show a larger percent of right answers than any of the more useful commodities.

Butter registered no right answers in the Kindergarten and First Grade. Only 7% in the Second Grade and 25% in the Third Grade were right. 8% of all children tested were right.

The children knew little more about eggs. Both the Kin-

dergarten and First Grade had no right answers. 26% of the Second and 42% of the Third Grade were right. Only 17% of all the children knew the price of eggs.

Not all of the children's parents owned cars. This may make some difference as to the knowledge of the price of gas. 0% of the Kindergarten, 0% of the First Grade, 3% of the Second Grade, and 16% of the Third Grade were right. Only 5% of all the children were right.

The price of milk was better than butter. Yet no one in the Kindergarten answered correctly; 15% in the First Grade, 8% in the Second Grade, and 27% in the Third Grade were right. 13% of all the children gave right answers.

Looking back over these results we find that more children knew the price of an ice-cream cone than of any other article, or 79%. The price of a lollipop was about the same, or 78%. The small Hershey bar came third with 37% right. Bread was next with 28%. Then came eggs (17%), milk (13%) and butter (8%), and gas for car 5%.

If the children are able to learn the price of an ice-cream cone and candy, why not bread, butter, milk, and eggs, which are all essential and a part of their daily life. A store unit in the Second and Third Grades is suggested to teach these.

Table VIII.- Showing % of impossible answers to Questions 2, 3, and 4b by Grades.

Article	Kindergarten	Grade I	Grade II	Grade III	Total
Bread	23%	16%	27%	26%	23%
Ice-Cream Cone	10%	12%	6%	12%	10%
Lollipop	23%	0%	8%	0%	8%
Hershey Bar	22%	25%	27%	41%	29%
Butter	33%	33%	42%	46%	34%
Eggs	22%	37%	19%	27%	24%
Gas for Car	19%	38%	14%	19%	22%
Milk	16%	26%	32%	40%	23%

Table VIII shows the percent of impossible answers to Questions 2, 3, and 4b by grades and total of all grades. The items represented in the Questions are bread, ice-cream cone, lollipop, Hershey bar, butter, eggs, gas for car, and milk. The price of the item was asked for in the Questions which are found in Exhibit I, pages 16 and 17.

23% of the Kindergarten gave impossible answers for the price of bread, 16% of the First Grade, 27% of the Second Grade, and 26% of the Third Grade. This makes a total of 23% for all of the children giving an impossible price for a loaf of bread.

10% of the Kindergarten gave an impossible answer for an ice-cream cone, 12% of the First Grade, 6% of the Second Grade, and 12% of the Third Grade. This makes a total of 10% giving an impossible price for an ice-cream cone.

23% of the Kindergarten, no one in the First Grade, 8%

in the Second Grade, and no one in Third Grade gave an impossible price for a lollipop. This makes 8% of all the children giving an impossible answer for the price of a lollipop.

22% of the Kindergarten, 25% in the First Grade, 27% in the Second Grade, and 41% in the Third Grade gave an impossible price for a small Hershey bar. This makes a total of 29% giving an impossible answer.

23% in the Kindergarten, 23% in the First Grade, 42% in the Second Grade, and 46% in the Third Grade gave an impossible price for butter. This makes 34% of all the children giving an impossible answer.

22% of the Kindergarten, 27% of the First Grade, 19% of the Second Grade, and 27% of the Third Grade gave an impossible price for the eggs. This makes 24% giving an impossible answer for the price of eggs.

19% of the Kindergarten, 38% of the First Grade, 14% of the Second Grade, and 19% of the Third Grade gave an impossible answer for the price of gas. This makes 22% of all the children giving an impossible answer.

16% of the Kindergarten, 26% of the First Grade, 32% of the Second Grade, and 49% of the Third Grade gave an impossible price for milk. This makes 33% of all the children giving an impossible price for milk.

Table IX.--Showing % of No Answers to Questions 2, 3, and 4b by Grades.

Article	Kindergarten	Grade I	Grade II	Grade III	Total
Bread	62%	67%	44%	11%	46%
Ice-Cream Cone	38%	5%	12%	6%	15%
Lollipop	35%	11%	11%	5%	16%
Small Hershey Bar	70%	47%	23%	11%	38%
Butter	77%	73%	70%	29%	62%
Eggs	50%	59%	41%	31%	45%
Gas for Car	60%	83%	51%	34%	57%
Milk	84%	58%	60%	24%	57%

Table IX shows the percent of the children giving no answers to the Questions 2, 3, and 4b by Grades.

62% of the Kindergarten gave no answer, 67% of the First Grade, 44% of the Second Grade, and 11% of the Third Grade. This made 46% of all the children giving no answer for the price of bread.

38% of the Kindergarten, 5% of the First Grade, 12% of the Second Grade, and 6% of the Third Grade gave no answer for the price of an ice-cream cone. This made 15% of all the children giving no answer for the price of an ice-cream cone.

35% of the Kindergarten, 11% of the First Grade, 11% of the Second Grade, and 5% of the Third Grade gave no answer for the price of a lollipop. This made 16% of all the children giving no answer for the price of a lollipop.

70% of the Kindergarten, 47% of the First Grade, 23% of

the Second Grade, and 11% of the Third Grade gave no answer for the price of a small Hershey bar. This made 38% of all the children giving no answer for the price of a small Hershey bar.

77% of the Kindergarten, 73% of the First Grade, 70% of the Second Grade, and 29% of the Third Grade gave no answer for the price of butter. This made 62% of all the children giving no answer for the price of butter.

50% of the Kindergarten, 59% of the First Grade, 41% of the Second Grade, and 31% of the Third Grade gave no answer for the price of eggs. This made 45% of all the children giving no answer for the price of eggs.

60% of the Kindergarten, 33% of the First Grade, 51% of the Second Grade, and 34% of the Third Grade gave no answer for the price of gas, making 57% of all the children giving no answer for the price of gas.

84% of the Kindergarten, 59% of the First Grade, 60% of the Second Grade, and 24% of the Third Grade gave no answer for the price of milk, making 57% of all the children giving no answer for the price of milk.

Only in the answers to the Questions on the price of an ice-cream cone and lollipops was there a small percent not answering.

Question 5a --"Did you ever buy a stamp?"--39% of the Kindergarten said Yes; 33% of the First Grade, 58% of the Second Grade, and 78% of the Third Grade had. 24% of the Kindergarten said No and 54% gave no answer; in the First Grade 38% said No, and 30% gave no answer; in the Second Grade 37% said No, and 7%

gave no answer. All of the children in the Third Grade answered, but 24% said that they had never been to the Post Office.

Question 5b--The cost of sending a letter to Boston--the cost ranged from 1¢ to $2.00. The majority of the children did not answer. 1 child in the Kindergarten gave the right answer; 3 in Grade I, 11 in Grade II, and 11 in Grade III gave the right answer.

The answers recorded by grade are found in Table X, page 44.

Question 5c--The cost of sending a letter in town--only 3 children of the whole group were right, and again the majority of the children did not answer. One child said it cost $5.90 and another 25¢. Yet the Post Office is a unit often recommended in the Second Grade. One Second Grade (Room 3) had had such a unit; one (Room 4) had not yet had it. In Room 3, Second Grade, only 28% knew the cost of a letter to Boston; while 25% in the other (Room 4) had the right answer. The record of the answers of all children in Room 3 and 4 is given under Table XI, page 46.

Table X--Showing the various answers to Question 5b--the price of a stamp for a Boston letter.

Price of Stamp	Kindergarten *1037	1038	Grade I R.1	R.2	Grade II R.3	R.4	Grade III R.5	R.6	Total
½¢							1		1
Right 3¢		1		3	6	5	6	5	26
1¢							1		1
2¢			1	1	1	1		3	7
2 or 3¢				1					1
5¢	1		1						2
10¢			1					1	2
15¢	1								1
15 or 25¢				1					1
61¢	1								1
90¢	2								2
Dollar				1					1
$2.00		1		1					2
No ans.	17	18	16	11	13	12	13	2	102
Total	22	20	19	19	20	18	21	11	150

*-R--Room

Table X shows the various answers to the Question 5b--What does it cost to send a letter to Boston? The answers are recorded by grade and room. The prices of the stamp as given by the children is under "Price of a Stamp". After the last price the no answers are given. The total for each price and for no answers is given in the column after the grades. The total for each room is given at the bottom of the page. The children giving the correct answer (3¢) are checked between the parallel lines.

Looking at the chart, it will be seen that the answers

went from ½¢ to $2.00. One child in the Third Grade, Room 5, said ½¢. No one in the Kindergarten, 1937, and only 1 child in the Kindergarten, 1938, knew the price of a stamp. 3 children in the First Grade, Room 2, 6 children in the Second Grade, Room 3, 5 children in the Second Grade, Room 4, 6 children in the Third Grade, Room 5, and 5 children in the Third Grade, Room 6, making a total of 26 children out of the 150 tested knew the correct price.

One child in the Third Grade, Room 5, said 1¢; 1 child in the First Grade, Room 1, 1 child in the First Grade, Room 2, 1 child in the Second Grade, Room 3, 1 child in the Second Grade, Room 4, and 3 children in the Third Grade, Room 6, said 2¢. 1 child in the First Grade, Room 2, said 2 or 3¢. 1 child in the Kindergarten, 1937, and 1 child in the First Grade, Room 1, said 5¢. 1 child in the First Grade, Room 1, said 10¢. One child in the Kindergarten, 1937, said 15¢. One child in the First Grade, Room 2, said 15 or 25¢. 1 child in the Kindergarten, 1937, said 61¢ and 2 children said 90¢; 1 child in the Kindergarten, 1938, and 1 child in the First Grade, Room 2, said $2.00.

17 children in the Kindergarten, 1937, and 18 children in the Kindergarten, 1938, gave no answer. 16 in the first grade, Room 1, and 11 in the First Grade, Room 2, gave no answer. 13 in the Second Grade, Room 3, and 12 in the Second Grade, Room 4, gave no answer. 13 in the Third Grade, Room 5, and 2 in the Third Grade, Room 6, gave no answer, making a total of 102 giving no answer. The fact that 2/3 of the children gave no answer would indicate that the Post Office and stamp buying were rarely parts of their

experiences, and it would seem therefore not a unit for Kindergarten, First Grade, Second Grade, or Third Grade.

Table XI.- Comparison of the answers in % given in Room 3 and Room 4 on the Post Office Question 5.

Question		Room 3	Room 4
5a- Did you ever buy a stamp?	Yes -	80%	39%
	No -	15%	55%
	No answer	5%	6%
5b- Cost to send a letter to Boston?	2¢	5%	6%
(right)	3¢ -	30%	29%
	No answer	65%	65%
5c -Cost to send a letter in town?	1¢-	30%	6%
	1½¢		6%
(right)	2¢	30%	6%
	3¢	10%	17%
	10¢	5%	
	No answer	25%	65%

In Table XI, Room 3 and Room 4 are compared with respect to the answers given to Question 5. This is on the Post Office. Room 3 had 20 children and Room 4 had 18 children. The right answers given for 5b and 5c are found marked (right) between the parallel lines. Room 3 had just completed a unit on the Post Office. Room 4 had never had any definite work on it. During the work on the unit, Room 3 visited the Post Office, bought stamps, etc. They built a Post Office in school, bought stamps (made by

the children), and sent letters to each other and to the children in the school. As far as is known, there had been no talk on the Post Office or its functions in Room 4.

It is interesting to note that in Room 3 only 80% said that they had even bought a stamp, 15% said that they had never bought a stamp, and 5% did not answer. The experience of this unit seems to have meant nothing to 20% or 1/5 of the class.

In Room 4, 39% had bought a stamp, 55% had never bought a stamp, and 6% did not answer. 39%, or 2/5 of the children in Room 4 had had the experience, and 60%, or 3/5, said that they had not. Only twice as many in Room 3 remembered about the visit to the Post Office and buying stamps.

The next part of the Question (5b) asks the cost of sending a letter to Boston. 5% of Room 3 and 6% of Room 4 said that a letter to Boston cost 2¢. 65% in each grade gave no answer, while 30% in Room 3 and 29% in Room 4 gave the right answer. Both Rooms gave approximately the same answers. 70% in Room 3 and 71% in Room 4 did not know. Only 1% more in Room 3 than in Room 4 knew the right answer.

The third part of the Question (5c) asks the cost to send a letter in town. In a small town like theirs, people do not often send letters to others in town; the telephone is used, or it is only a short walk to any part of the town.

In Room 3, 30% said 1¢, 10% said 3¢, and 5% said 10¢, while 25% gave no answer. 70% did not know, yet in this Room the Post Office had been a unit of work. In Room 4, 6% said 1¢, 6% said 1½¢, 17% said 3¢, and 65% did not answer, or 94% did not

know. 6% in the Room gave the right answer.

It would appear that the Post Office as a unit is beyond a Second Grade. As shown by the results in Room 4, it does not function in their lives, and as shown by the results in Room 3, the experience as presented by the school does not give results. Room 3, having studied the unit, was not outstanding in any way; in fact, it did not do better in the knowledge of the price of a stamp to send a letter to Boston.

Question 6a--The cost of the daily paper--This gave no better results than the cost of stamps in the previous question. 12% of the Kindergarten, 8% of the First Grade, 17% of the Second Grade, and 57% of the Third Grade had correct answers. The price went from 1¢ to $1.00 a day.

Question 6b--The cost of the Sunday paper--The children knew more about this. 22% of the Kindergarten knew the price, 28% of the First Grade, 23% of the Second Grade, and 30% of the Third Grade knew the price.

Question 7a--"What is this coin?"--One Kindergarten and one First Grade had just completed a formal study of United States money. The results are interesting. In the Kindergarten, (having studied coins) 94% knew a cent, 71% knew a dime, 53% knew a quarter, and 33% knew a half dollar. In the other Kindergarten 80% knew a cent, 69% knew a dime, 34% knew a quarter, and 24% knew a half dollar. The results in the two First Grades were similar. What had it profited them?

The tabulation of all answers to this Question and the following Question 8 is found in Exhibit III, page 49.

Showing answers to the questions on money, questions read, as given by the children by grade, room age and

	Kindergarten 1937 Boys	Kindergarten 1937 Girls	Kindergarten 1938 Boys	Kindergarten 1938 Girls	Grade I Room 1 Boys	Grade I Room 1 Girls	Grade I Room 2 Boys	Grade I Room 2 Girls	Grade II Room 3 Boys	Grade II Room 3 Girls	Grade II Room 4 Boys	Grade II Room 4 Girls	Grade III Room 5 Boys	Grade III Room 5 Girls	Grade III Room 6 Boys	Grade III Room 6 Girls
7 What is ten-cent																
right	4 2 6	7 7 14	1 8 9	2 5 9	1 4 4 2 3 14	2 2 1 5	2 3 4 9	5 4 1 10	1 4 2 1 8	1 1 2 3 5 12	1 3 3 3 1 11	3 2 1 6	4 7 1 12	2 5 1 1 9	1 3 2 6	1 2
nickel		1 1									1 1					
dollar				1 1												
no ans.		1 1	2 2	1 1												
% right	100 100 100	88 88 88	100 80 82	100 72 82	100 100 100 100 100 100	100 100 100 100	100 100 100 100	100 100 100 100	100 100 100 100 100	100 100 100 100 100 100	100 100 100 100 100 92	100 100 100 100	100 100 100 100	100 100 100 100 100	100 100 100 100	100 100
% wrong		12 12 6		14 9							100 8					
% no ans.		12 6	20 18	14 9												
What is this-nickel																
right	2 1 3	6 7 13	1 8 9	2 3 5	1 4 4 2 3 14	2 2 1 5	2 3 3 8	5 4 1 10	1 4 2 1 8	1 1 1 3 5 11	1 3 3 2 1 1 11	3 2 1 6	4 7 1 12	2 5 1 1 9	1 3 2 6	1 2
dime		1 1								1 1						
quarter	1 1			2 2			1 1				1 1					
no ans.	1 1 2	2 2	2 2	2 2												
% right	50 50 60	75 88 81	100 80 82	100 42 56	100 100 100 100 100 100	100 100 100 100	100 100 75 88	100 100 100 100	100 100 100 100 100	100 100 50 100 100 92	100 100 100 67 100 100 92	100 100 100 100	100 100	100 100 100 100 100 100 100	100 100	100 100 100 100
% wrong	25 17	12 6		29 22			25 12			50 8	33 8					
% no ans.	25 50 33	25 13	20 18	29 22												
What is this-dime																
right	2 1 3	4 6 10	1 8 9	2 5 7	1 4 3 2 3 13	2 2 1 5	2 3 4 9	5 4 1 10	1 4 2 1 8	1 1 1 3 5 11	1 3 3 3 1 1 12	3 2 1 6	4 7 1 12	2 5 1 1 9	1 3 2 6	1 2
nickel		2 2														
8¢		1 1														
quarter										1 1						
no ans.	2 1 3	3 3	2 2	2 2	1 1											
% right	50 50 50	50 75 62	100 80 83	100 73 78	100 100 75 100 100 93	100 100 100 100	100 100 100 100	100 100 100 100	100 100 100 100 100	100 100 50 100 100 92	100 100 100 100 100 100	100 100 100 100	100 100	100 100 100 100 100 100 100	100 100	100 100 100 100
% wrong		17 25 17								50 8						
% no ans.	50 60 50	33 17	20 17	27 22	25 7											
What is this-quarter																
right	2 1 3	4 5 9	5 5	2 2	1 3 4 1 3 12	2 2 4	1 3 3 7	4 3 1 8	1 4 1 1 7	1 1 2 3 4 11	1 3 2 2 1 9	2 2 1 5	4 7 1 12	2 5 1 1 9	1 3 2 6	1 2
nickel	1 1	1 1	1 1 2						1 1							
7¢		1 1														
half quarter					1 1											
half dollar		1 1	1 1		1 1					1 1						
50¢												1 1				
dollar							1 1				1 1					
no ans	1 1 2	3 1 4	3 3	2 5 7		1 1	1 1	1 1 2			1 1 2					
% right	50 50 50	50 63 55	60 71	29 22	100 75 100 50 100 85	100 100 80	60 100 67 78	80 75 100 90	100 100 60 100 88	100 100 100 100 80 91	100 100 67 67 100	75 67 100 100 83	100 100	100 100 100 100 100 100 100	100 100	100 100 100 100
% wrong	25 17	13 25 20	100 20 27		25 50 16		25 11		60 12	20 9	100 8 33	17				
% no ans.	25 50 33	37 12 26	30 27	100 71 78		100 20	60	11 20 25 22			33 33	17				
What is this-half dollar																
right	1 1 2	2 2	4 4	1 1	1 2 2 3 8	2 2 1 5	2 3 1 6	1 3 1 5	1 3 2 1 7	1 2 3	1 3 2 2 1 9	2 2 1 5	3 7 1 11	2 5 1 1 9	1 3 2 6	1 2
1¢							1 1									
nickel		1 1														
8¢		1 1														
dime								1 1								
20¢		1 1														
half a quarter		1 1														
whole quarter					1 1											
another quarter		1 1														
quarter dollar																
quarter	1 1	1 2 3	1 2 3	1 1 2	1 1 2				1 1	1 1			1 1			
25¢					1 1											
half dollar bill																
one dollar	1 1			2 2	1 1			3 3	1	1	1 1 2					
silver dollar									1 1	2	1 1					
$2.00										1 1						
no ans.	2 2	5 1 6	4 4	1 3 4	1 1		2 2	1 1	1	1 2 1 4		1 1				
% right	25 50 29	25 12	40 40	19 12	100 50 50	100 57 100 100 100 100	100 100 25 67	20 75 100 50	100 75 100 100 66	33 40 25	100 100 67 67 100	25 67 100 100 83	100 100	100 100 100 100 100 100 100	100 100	100 100 100 100
% wrong	25 50 33	38 63 50	100 20 21	50 43 44	25 50 100	36	25 11	60 25 40	25 12	100 50 80 42	33 33	16 25				
% no ans	50 33	62 12 38	40 21	50 93 44	25	7	60 22	20 10		80 20 33		33 17				
8 Count-10 cents																
right	3 1 4	7 7 14	7 7	1 4 5	4 4 2 3 13	1 2 1 4	2 3 4 9	5 4 1 10	1 3 2 1 7	1 1 2 3 5 12	1 3 3 3 1 11	3 2 1 6	4 7 1 12	2 5 1 1 9	1 3 2 6	1 2
8		1 1	1 1													
9		1 1	1 1	1 1					1 1							
11	1 1		1 1			1 1										
50			1 1	1 1							1 1					
100				1 1												
by 1's 100					1 1											
no ans.	1 1			1 1												
% right	75 50 66	66 88 78	70 64	50 57 56	100 100 100 100 93	50 100 100 100	100 100 100 100	100 100 100 100	100 66 100 100 88	100 100 100 100 100 100	100 100 100 100 100	92 100 100 100 100	100 100	100 100 100 100 100 100 100	100 100	100 100 100 100
% wrong	25 17	12 12 12	100 30 36	50 29 33	100	7 0			34 12		100 8					
% no ans.	60 17			17 11												
Count-5 nickels																
right	2 1 3	3 3		1 1	1 3 3 7	1 2 3	2 2 4	1 4 5	1 2 2 1 6	1 1 1 3 6	2 2 1 1 6	3 2 1 6	4 7 1 12	2 4 1 7	1 3 2 6	1 2
2 nickels											1	1				
4		1 1														
all nickels								1 1								
5 rives								1 1								
5¢		1 1		2 2	1 1 2		1 1									
5 nickels		4 4 8	5 5	3 3			1 1	2 2								
5 dimes									1 1							
5 quarters	1 1															
5 dollars		1 1														
4											1 1					
10¢				1 1			1 1									
15¢								1 1			1	1				
20 pennies			1 1													
30¢										1 1						
40¢					1 1 1 3		2 2		1 1		1 1					
dollar									1	1						
no ans.	1 1 2	2 2	1 4 5	2 2	1 1 2 1	1 2			1 1	2 1 3	1	1	1 1 2			
% right	50 33 50	33 17		16 11	100 70 16	50 57 100 25	67 50 45	90 100 50	100 33 100 100	12 100	57 33	100 100	100 100	100 100 100 100		
% wrong	25 11	71 61 62	60 80	100 51 67	25 20 50 100 25		100 33 60 25	30 100 50	25	9	100 33	64				
% no ans.	25 50 33	27 13	100 40	33 33		50 33 16 33	100 23				33	5		33 33		
Count 10 dimes																
right	2 2 4	1 1		1 1	1 3 3 1 1 9	1 2 1 4	1 2 1 4	1 4 1 6	1 2 1 4	1 1 1 3 6	3 2 1 1 7	2 2 4	4 7 1 12	3 1 1 7	3	2 5 1 2
8		1 1	1 1													
9 dimes		1 1 2	1 1	1 1				1 1								
10	1 1	3 1 4	3 3	2 3 5			1 1	1 1					1 1			
10 dimes		1 1 2				1 1	1 1	1 1	1 1	1 1						
11 nickels		1 1														
11 dimes		1 1	1 1													
18¢				1 1	1 1											
19¢											1 1					
20																
21 dimes										1 1						
39¢												1 1				
50¢																
55¢							1 1									
60			1 1													
70¢									1 1		1 1		1 1		1 1	
100 dollars											1 1					
100 dimes					1 1		1 1									
$1.10							1 1									
$1.30									1 1	1	1 1					
$2.00																
all dimes							1 1									
don't know																
no ans.	1	1 2 7	1 3 4	1 1	1 1	2 1 1				1 1	1 1	1 1				
% right	50 100	40 12 6		14 11	[illegible]	65 50 100 10 50	100 61 25 45	20 71 100 50	100 30 60	60 67 100 100 23 60	100 33	100 57 67 100 67	100	100 100 100 100 100 100	100	100 33 100
% wrong	50	11 75 36	100	100 75 78	25	100 21	60 33 15 33 50	40	80 60 100	53 67 49 91	100 33 67	100 33		33 12	100	11
% no ans.	50	17 25 25	50 20	17 11	25	14 35	50									

Exhibit III shows the answers of all the children by grade, room, sex, and age to the questions on United States money,--Questions 7 a, b, c, d, e, and 8 a, b, c, on the Questionnaire as given in Exhibit I. This is a photostatic copy of the original table as made from the results of the individual tests and tabulated as shown. The table of Exhibit III is read as follows:- To the Question 7a-"What is this coin?"(showing the child a cent) 4 boys from the age of 5^0 years through 5^5 years said that it was a cent. 2 boys through the ages of 5^6- 5^{11}said it was a cent, making a total of 6 boys (under Total) in the Kindergarten, 1937, who said cent, etc., as previously explained under Exhibit II, page 24.

Question 8a-"Can you count?"- Except in the Kindergarten and for one in the First, one in the Second Grade who did not answer at all, the children said that they could count. 88% of the 1937 Kindergarten said that they could count. 76% of the 1938 Kindergarten said that they could count. 12% of the Kindergarten, 1937, and 24% of the Kindergarten, 1938, said that they could not count.

Question 8b-"Count these coins"--ten cents were given the child. 64% of the Kindergarten, 93% of the First Grade, 95% of the Second Grade, and 100% of the Third Grade were right.

Question 8c-"Count these coins"- five nickels were given the child. 20% of the Kindergarten, 51% of the First Grade, 88% of the Second Grade, and 97% of the Third Grade were right.

Question 8d- "Count this money"- ten dimes were given to the child. 21% of the Kindergarten, 62% of the First Grade, 59%

of the Second Grade, and 96% of the Third Grade were right.

The responses to this question can be seen in Exhibit III, page 49.

One Second Grade had formal arithmetic, one had not. Yet it is impossible to tell by looking at the chart that the Second Grade, Room 3, had the formal arithmetic and that the Second Grade, Room 4, had informal arithmetic. Room 4, with informal arithmetic, had better results than Room 3 , as can be seen by looking at Table XII, below.

Table XII- Room 3, Grade II had formal arithmetic. Room 4, Grade II had informal arithmetic. These records show the results of Question 8 for the two Grades.

Grade II

8a-Count this money	Room 3		Room 4		Total	
	*B.	G.	B.	G.	R.3	R.4
10 cents						
right	87%	100%	92%	100%	94%	96%
wrong	13%		8%		6%	4%
no answer					0	0
8b-Count this money						
5 nickels						
right	76%	50%	50%	100%	64%	75%
wrong	12%	25%	42%		18%	21%
no answer	12%	25%	8%		18%	4%
8c-Count this money						
10 dimes						
right	50%	50%	58%	66%	50%	62%
wrong	50%	42%	42%	17%	46%	29%
no answer		8%		17%	4%	9%

* B- Boys
G- Girls

Table XII shows the percents to Question 8 on counting money obtained by the Second Grade, Rooms 3 and 4. Room 3 was

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Library

taught arithmetic formally, and Room 4 informally. The results are interesting.

To the Question-"Count this money", 10 cents were given the children. In Room 3, 87% of the boys, 100% of the girls, or 94% of all the children gave the right answers. 13% of the boys or 6% of all the children were wrong. In Room 4, 92% of the boys and 100% of the girls, or 96% of all the children were right. 8% of the boys or 4% of all the children were wrong. Room 4 had 2% more right and 2% less wrong than Room 3.

To the Question -"Count this money", 5 nickels were given the children. In Room 3 76% of the boys and 50% of the girls, or 64% of all the children were right. 12% of the boys and 25% of the girls or 18% of all the children were wrong; and 12% of the boys and 25% of the girls or 18% of all the children gave no answer. In Room 4, 50% of the boys and 100% of the girls or 75% of all the children were right; 42% of the boys, or 21% of all the children were wrong, and 8% of the boys or 4% of all the children gave no answer. Room 4 had 11% more right, and 14% less giving no answer than Room 3. Room 3 had 3% less wrong than Room 4.

To the Question - "Count this money" (&c) the children were given 10 dimes. In Room 3 50% of the boys and 50% of the girls or 50% of all the children were right. 50% of the boys, 42% of the girls, or 46% of all the children were wrong. 8% of the girls or 4% of all the children gave no answer.

In Room 4, 58% of the boys and 66% of the girls or 62% of all the children were right. 42% of the boys and 17% of the

girls, or 29% of all the children were wrong. 17% of the girls or 9% of all the children gave no answer. Room 4 had 12% more children right than Room 3. Room 4 had 17% less wrong than Room 3, and Room 4 had 5% less giving no answer.

It will be seen that Room 4, the informal Room, had more right than Room 3, the formal Room. The findings here agree with those of Miss Harris (who has been referred to before), who found informal teaching more fitted to the lower grades.

Question 9a- "How many nickels in a dime?"-3% of the Kindergarten, 32% of the First Grade, 73% of the Second Grade, and 100% of the Third Grade were right.

Question 9b- "How many dimes in a dollar?"- No one in the Kindergarten knew; 17% of the First Grade, 35% of the Second Grade, and 71% of the Third Grade were right.

Question 9c- "How many quarters in a dollar?" No one in the Kindergarten knew; 4% of the First Grade, 32% of the Second Grade, and 60% of the Third Grade were right.

Question 9d-"How many cents in a quarter?"- No one in the Kindergarten knew; 26% of the First Grade, 37% of the Second Grade, and 90% of the Third Grade were right.

The Kindergarten knew almost nothing about money; even by the time the children reach the Third Grade their money sense is far from perfect.

Question 10- "Can you count?"- Most of the children felt that they could count. 87% of the Kindergarten, 98% of the First Grade, 97% of the Second Grade, and 100% of the Third Grade said that they knew how to count.

Question 10b- "Count to 100 by 1."- 11% of the Kindergarten counted correctly; 74% of the Kindergarten counted incorrectly, and 15% did not try. 63 % of the First Grade counted correctly, 35% counted incorrectly, and 2% did not try. 96% of the Second Grade counted correctly and 4% counted incorrectly. 96% of the Third Grade counted correctly and 4% counted incorrectly.

Question 10c- "Count to.100 by 10."- No child in the Kindergarten could do this. 2% in the Kindergarten were wrong, and 98% did not try. 79% of the First Grade were right; 79% of the Second Grade were right, and 92% of the Third Grade were right .

Question 10d- "Count to 100 by 5." No child in the Kindergarten attempted to answer. 26% of the First Grade were right and 48% did not answer. 55% of the Second Grade were right and 80% of the Third Grade were right.

Question 11 - "Count these objects-(20 marbles)".-22% of the Kindergarten, 81% of the First Grade, 95% of the Second, and 96% of the Third Grade were right.

Exhibit IV, page 55, shows how the children answered Questions 10 and 11.

Exhibit IV shows the answers of all the children by grade, room, sex, and age to the questions on counting, Questions 10 a, b, c, d, and Question 11 on the Questionnaire as given in Exhibit I. This is a photostatic copy of the original table as made from the results of the individual tests and tabulated as shown. The table of Exhibit IV is read as follows: To the

Exhibit

Showing answers to the questions on counting, questions 10 and 11, as given by the children by room grade

	Kindergarten 1937 Boys | Girls	Kindergarten 1938 Boys | Girls	Grade I Room 1 Boys | Girls	Grade I Room 2 Boys | Girls	Grade II Room 2 Boys | Girls	Grade II Room 3 Boys | Girls	Grade III Room 4 Boys | Girls	Grade III Room 5 Boys | Girls
11a Can you count								
yes	4 2 6 7 5 12	1 7 8 2 5 7	1 4 3 2 3 13 2 2 1 5	2 3 4 9 5 4 1 10	4 2 1 7 1 1 2 3 5 12	1 3 3 3 1 1 12 3 2 1 6 47	1 12 2 5 1 1 9	1 3 2 6 1 2 1 1 5
no	1 3 4	3 3 2 2						
no ans.			1 1		1 1			
% yes	100 75	73 78	93 100	100 100	88 100	100 100	100 100	100 100
% no	25	27 22	7					
% no ans.					12			
11b Count—one by 1								
Counted to 5	1 1	1 1						
9	1 1	1 1						
10		1 1						1 1
11	1 1							
12	1 1							
13	1 1	1 1						
14	1 1	1 1						
15	1 1							
16	2 1 3	1 1						
17			1 1					
19	1 1	1 1 1 1	1 1					
26		1 1 1 1	1 1					
29	1 1	2 2 1 1 2	1 1 1 1					
32			1 1					
39	1 1 2	1 2 3 1 1	1 2 1 4					
67			1 1			1 1		
69	1 1							
75		1 1						
89				1 1	1 1			
Left out 1 etc.			1 1 2	1 1				
right	1 1 2 2 2		1 1 2 1 2 3	1 3 4 8 4 4 1 9	1 4 2 1 8 1 1 2 3 4 11	1 3 3 3 1 11 3 2 1 6 47	1 12 2 5 1 1 9	1 2 2 5 1 2 1 1 5
no ans	1 2 3	1 1	1 1					
% right	33 12		19 60	89 90	90 92	42 100	100 100	83 100
% wrong	67 69	91 100	79 40	11 10	8	8		17
% no ans	19	9	7					
10c Count—in by 5								
Counted to 10					1 1	1 1		
by 5								
to 20					1 1	1 1		
to 65					1 1			1 1
to 90					1 1			
right			1 2 2 3 8 1 2 1 4	2 3 4 9 3 4 1 8	1 5 1 1 6 1 1 1 2 5 10	1 3 2 2 1 1 10 2 2 1 5 47	1 12 2 4 1 1 8	1 3 2 6 1 2 1 4
wrong	1 1					1 1	1 1	
no ans	4 2 6 7 8 15	1 10 11 2 7 9	2 2 2 6 1 1	2 2				
% right			57 80	100 80	75 83	89 83	100 89	100 80
% wrong	7				25 17	5 17		20
% no ans.	100 93	100 100	43 20	20		8	11	
10d Count—in by 5								
Counted to 10			2 2 4	1 1 1 1	2 1 3 1 1	1 1 1 1 2		
16			1 1		1 1			
20						1 1		
30			1 1					
40				1 1				
60						1 1		
65								1 1
85							1 1	
90					1 1			
Left out one				1 1				
counted by 1								
right				1 2 3 6 3 2 5	1 2 1 4 1 1 1 3 3 9	1 2 2 2 1 8 2 2 4 47	1 12 2 4 1 7	1 3 2 6 1 2 1 4
no ans	4 2 6 8 8 16	1 10 11 2 7 9	1 3 2 2 1 9 2 1 1 4	1 1 2 1 3	1 1	1 1	1 1	
% right			36	67 50	50 76	68 67	100 78	100 80
% wrong			20	22 20	50 16	24 33	11	20
% no ans	100 100	100 100	64 80	11 30	8	8	11	
11 Count 20 objects								
said 4	1 1	1 1						
12	1 1							
14	1 1	1 1						
16	1 1				1 1			
17	1 1							
18				1 1				
19	1 1				1 1		1 1	
21	1 1 2 2	1 1	1 1 1 3 1 1	1 1			1 1	
22	1 1 1 1							
23	1 1	1 1						
24	1 1		1 1					
25			1 1					
right	1 1 4 4 8	8 8 1 5 6	1 3 2 1 2 9 2 2 4	2 3 3 8 4 4 1 9	4 2 1 7 1 2 1 2 5 11	1 3 3 3 1 1 12 3 2 1 6 45	1 10 2 5 1 1 9	1 3 2 6 1 2 1 1 5
no ans		2 2						
% right	17 50	74 67	64 80	89 90	88 92	100 100	83 100	100 100
% wrong	83 50	26 11	36 20	11 10	12 8		17	
% no ans		22						

Question 10a- "Can you count?" 4 boys from the ages of 5^{0} years through the ages of 5^{5} years said that they could count; 2 boys through the ages of 5^{6} - 5^{11} years said that they could count, making a total of 6 boys (under Total) in the Kindergarten,1937, who said that they could count, etc., as previously explained under Exhibit II, page 24.

Question 12a-"Give me three marbles." 95% of the Kindergarten, 80% of the First Grade, and 100% of the Second and Third Grade were right.

Question 12b- "Give me 7 marbles."- 73% of the Kindergarten, 85% of the First Grade, 94% of the Second Grade, and 100% of the Third Grade were right.

Question 12c-"Give me 5 marbles." 83% of the Kindergarten 93% of the First Grade, and 100% of the Second and Third Grades were right.

Question 12d-"Give me 8 marbles."- 66% of the Kindergarten, 92% of the First Grade, 97% of the Second Grade, and 100% of the Third Grade were right.

Question 12e-"Give me 10 marbles."- 64% of the Kindergarten, 86% of the First Grade, and 100% of the Second and Third Grade were right.

Question 12f-"Give me 1 marble." 100% of the Kindergarten, 98% of the First Grade, and 100% of the Second and Third Grades were right.

Question 12g-"Give me 4 marbles."-89% of the Kindergarten, 95% of the First Grade, and 100% of the Second and Third Grades were right.

The Second Grade having informal arithmetic showed better results on Question 12 than the Second Grade having formal arithmetic.

Question 13a-"Can you read numbers?"- 38% of the Kindergarten said "Yes", 45% said "No", and 17% gave no answer. 72% of the First Grade said "Yes", 5% said "No",and 23% gave no answer. 79% of the Second Grade said "Yes", 8% said "No", and 13% gave no answer. 78% of the Third Grade said "Yes", and 22% gave no answer.

Question 13b- "Read these numbers." The numbers were as follows:- 1, 3, 5, 7, 8, 12, 14, 29, 36, 45, 84. The Kindergarten did almost nothing at all. The First Grade showed marked improvement as the reading of numbers is taught there, while the Second and Third Grade were practically perfect.

Question 14a- "Where do you read numbers?"-The children reported "No" in 45 situations ; however, one child in Second Grade said "Alphabet". Of the children's answers, this seemed the only one that was not possible. About 1/3 of the children thought that they could not read numbers. About 2/3 of the children gave possible answers. A list of the answers is given on page 58. There were 45 places given where the children read numbers.

List of Answers Given to the Question (14a)- "Where Do You Read Numbers?"

Calendar
Auto plates
On paper
On doors
At home
In books
My blackboard
On nickels
Counting money
Tickets
Store-signs
Clock
Peano
Arithmetic Book
Signs

Electric Light Bill
On road
At stores
Telephone book
At desks
On houses
Charts
Arithmetic papers
Newspapers
Number Cards
On boards
Sister writes numbers
Where there are number pictures
Made by parents
In school

In room
When you write them
Fire truck
Alphabet
Arithmetic
Shoe boxes
On money
In index
In spelling
Boxes
Bags
Cents
Tests
Doing arithmetic
Color book

Question 14b- "How do you tell the day?"--36% of the Kindergarten gave possible answers, 5% gave impossible answers, and 59% did not answer. 45% of the First Grade gave possible answers, 15% gave impossible answers, and 30% did not answer. 71% of the Second Grade gave possible answers, 11% gave impossible answers, and 18% did not answer. 93% of the Third Grade gave possible answers, 7% gave impossible answers, and everyone answered.

Question 14c--"Find today on the calendar."- 20% of the

Kindergarten were right, 9% were wrong, and 71% did not answer. 42% of the First Grade were right, 15% were wrong, and 43% did not answer. 74% of the Second Grade were right, 4% were wrong, and 22% did not answer. 76% of the Third Grade were right, 8% were wrong, and 16% gave no answer.

Question 15a - "How do you know time?"--The tabulation is found in Exhibit II, page 24. 10 ways were given by the children. These are listed below:-

List of Answers to Question 15.

Watch
Clock
Hands on Numbers
By hands
By sun
Ask
Look in house
2 o'clock
Count numbers
Learn

57% of the Kindergarten, 76% of the First Grade, 86% of the Second Grade, and 93% of the Third Grade were right. 73% of all children knew where to tell time.

Question 15b--"What time does school begin?"--Both the time of beginning in the morning and the afternoon were counted right. Even many Third Grade children did not know. 11% of the Kindergarten, 41% of the First Grade, 69% of the Second Grade, and 82% of the Third Grade were right.

Question 15c--"What time do you eat dinner?"--This was checked. 38% of the Kindergarten, 59% of the First Grade, 77% of the Second Grade, and 92% of the Third Grade were right.

Question 15d--"What time do you eat supper?"--This was

checked. 22% of the Kindergarten, 37% of the First Grade, 46% of the Second Grade, and 57% of the Third Grade knew their supper-time.

Question 15e--"Find the time school begins."--6% of the Kindergarten, 19% of the First Grade, 49% of the Second Grade, and 57% of the Third Grade were right.

Question 15f-"What time is this-9:00?"- The hands of the clock were turned to make it 9:00. 23% of the Kindergarten, 39% of the First Grade, 53% of the Second Grade, and 87% of the Third Grade knew the time.

"What time is this-12:00?"--The hands of the clock were turned to make it 12:00. 53% of the Kindergarten, 49% of the First Grade, 78% of the Second Grade, and 85% of the Third Grade knew the time.

"What time is this-3:30?"- The hands of the clock were turned to make it 3:30. 4% of the Kindergarten, 22% of the First Grade, 17% of the Second Grade, and 51% of the Third Grade knew the time, and this was dismissal time for the school.

Question 16a- "When is your birthday? month?"-- 47% of the Kindergarten, 48% of the First Grade, 74% of the Second Grade, and 88% of the Third Grade knew the month of their birth.

Question 16b- "What is the month and day of your birthday?"--The day of the month the children were not sure of. 31% of the Kindergarten, 37% of the First Grade, 63% of the Second Grade, and 81% of the Third Grade were right.

Question 16c--"How old are you?"--The children were for the most part sure of their age. 80% of the Kindergarten, 83% of

the First Grade, 89% of the Second Grade, and 76% of the Third Grade were right.

Question 16d--"Age of brothers or sisters?"-- 57% of the Kindergarten, 80% of the First Grade, 92% of the Second Grade, and 90% of the Third Grade were right.

Question 17a--"How tall are you?"--Few of the children even in Third Grade knew how tall they were. 0 % of the Kindergarten, 5 % of the First Grade, 0 % of the Second Grade, and 18 % of the Third Grade were right.

Question 17b--"How would you find out?"--17 answers were given. As will be seen by looking at the list given below, most of the answers were possible. Weight and scales meant the scales that they stand on for measuring in school. About 50% of the Kindergarten did not answer and a few in First Grade, but for the most part the children gave possible answers.

List of Answers Given to Question 17b--

How to find out how tall you are.

Mark on door
Measuring stick
Ruler
Measure
Yard stick
Stand against someone
By a thing
Scales
Thing in Health Room
Measuring thing
Have Father measure
Height stick
Measure up-town
Stand up
Ask some one

Question 18a--"Which is larger--a whole apple or half an apple?" -- 73% of the Kindergarten were right, 95% of the First

Grade, 94% of the Second Grade, and 97% of the Third Grade were right.

Question 18b--"Which is larger--a half an apple or a quarter of an apple?"--11% of the Kindergarten, 46% of the First Grade, 77% of the Second Grade, and 91% of the Third Grade were right.

Question 18c--"Which is larger--a pint or a quart?"--30% of the Kindergarten, 45% of the First Grade, 71% of the Second Grade, and 90% of the Third Grade were right.

Question 18d--"Which is larger--an inch or a yard?"--20% of the Kindergarten, 68% of the First Grade, 93% of the Second Grade, and 97% of the Third Grade were right.

Question 19a--"How many pieces--half?"--68% of the Kindergarten, 90% of the First Grade, 83% of the Second Grade, and 98% of the Third Grade were right.

Question 19b--"How many pieces--quarter?"--12% of the Kindergarten, 27% of the First Grade, 51% of the Second Grade, and 83% of the Third Grade were right.

Question 20--"Work"-- It is of interest to see that hardly a child was given money regularly for a regular job. In the Kindergarten only 23% said they had earned money, 65% in the First Grade, 51% in the Second Grade, and 80% in the Third Grade. None of these children had a stated amount each week or steady jobs. The jobs are listed with amount received under List on pages 63, 64, and 65.

List of the Jobs the Children Did, the Amount Received, and Who Paid Them.

In Answer to Question 20.

JOB	PAY	BY WHOM
	Kindergarten, 1937	
hoed garden	$6.00	Father
works	money for ice-cream cone	Mother
wash dishes and sweep	1¢	Mother
	Kindergarten, 1938	
empty waste-basket put out milk bottles	money once a week for bank	Mother
peddles papers	85¢	Mother
take out milk bottles	money for bank	Mother
sweep sidewalk	$1.00 a week	Mother
wipes dishes Saturday	nickel	Mother
helped Uncle paint store	nickel	Uncle
help Mother	1 penny for bank	Mother
help with dishes	5¢ or 1¢	Mother
	Grade I, Room 1	
made airplane	25¢	Neighbor
picked up wood	nickel	Father
emptied waste-basket	15¢ per week	Mother
go to store	1 penny	Mother
mow lawn	15¢	Father
carried in wood	penny	Cousin
empty cans	5¢	Aunt
go to store	penny	Men
bring up wood	bank money	Mother
run errands	10¢	Mother
pick up stones	10¢	Neighbor
pick violets	5¢	Mother
sweep; wash clothes; wash dishes	10¢	Mother
	Grade I, Room 2	
carrying milk bottles work in garden	$2.25	Grandmother
dust	1¢	Father, Mother
scratching her back	5¢	Mother
shovel snow	1¢	Grandmother
hoe garden and everything	5¢	Neighbor
get wood	sometimes a nickel	Neighbor

JOB	PAY	BY WHOM
pick up cousin's garage when Father works	penny	Garage man
make beds; wipe dishes	quarter	Mother
do dishes for neighbor	nickel, or dime, or penny	Neighbor
help Daddy get bread	--	--
go down town	5¢	--
wipe dishes; go to store	quarter 2 pennies 2 nickels	--
Sister and I empty waste-baskets	10¢ every Saturday	Father or Mother
clean house	penny or so	Mother

Grade II, Room 3

clean garden; plant flowers; keep place clean	25¢ when I do all good work	Lady
clean driveway and yard	10¢	Landlord
clean up yard; take rubbish to dump	25¢	Neighbor
(help Daddy water chicks; feed and water cows ; take cows to pasture	$1.00 a week	Father
cut grass; rake lawn	35¢	--
good report	25¢ $1.00	Daddy Uncle
make beds on Saturday; wash dishes; dust furniture	20¢	Mother
go to store; rake yard; wash dishes	quarter	Mother

Grade II, Room 4

rake leaves; dig snow	--	Neighbor
vacuum; wash dishes; clear table	5¢ every time I help	Mother
rake lawn	nickel or dime	Father
pull weeds in garden	5¢	Mother or Father
errands	5¢	Grandmother
rake leaves	10¢	Neighbor
throw wood down cellar	5¢	Dad

JOB	PAY	BY WHOM
rake leaves; feed chickens cut grass	50¢ every Saturday	Father and Mother
clean yard; clean rabbits; mow lawn	penny or 2¢	Father
pick up rags (sold them)	dime	Lady
cultivate corn	$1.00 paid to Father	Neighbor
wash and wipe dishes	5¢	--
dust; sweep; wash dishes; help Daddy	5¢ or 10¢ when I work	--

GRADE III, Room 5

rake leaves in summer	50¢ or $1.00	Neighbors
pack eggs	5¢ a case or 50¢ a week	Father
haul wood	25¢	Father
go down town; mow lawn	50¢ or $1.00 a month	Father
spade garden	5¢	Father
help put in stakes	10¢	Neighbor
dust	5¢	Mother
empty garbage	10¢ a week	Father
mow lawn	25¢	Father
mow lawn	10¢	Grandmother
clean kitchen	5¢	Mother
do dishes	5¢	Mother
push the baby	25¢	Neighbor
rake the lawn	10¢	Father
dishes	allowance	Mother
wash dishes	--.	--
rake lawn; cook meals	10¢	Father

GRADE III, Room 6

cut down trees	10¢	Grandfather
help carry flowers; plant seeds	10¢ or 15¢	--
baby	25¢	Mother
mow lawn	50¢ per hour	--
help Sunday paper boy	10¢ pay	--
pick blueberries	$4.00	--
do things for neighbors	5¢ or 10¢	Neighbor
wash dishes; make beds	about 10¢	--
help Mother	quarter	--
run errands for neighbor	penny or nickel	Neighbor
take baby out	25¢ sometimes	Lady
clean house; make beds	sometimes 25¢ or 35¢	--

The Results Compared with Other Studies.

Miss Helen Gorham made a study in the Kindergarten and two First Grades using the same questionnaire as was used in this study. Her results were about the same. There were 54 children examined.

Miss Gorham found that 92% had been shopping, while in this study in the Kindergarten and First Grades 70% had been shopping. In neither case did many of the children know the cost of what they had bought.

What does Mother pay for bread? Miss Gorham found that 31% gave a reasonable answer. In this study in the Kindergarten and First Grades 12% of the children gave reasonable answers.

What is the cost of an ice-cream cone? The children in both studies knew better about ice-cream and lollipops. Miss Gorham found that 83% of the children knew the price of an ice-cream cone. 73% of the children in this study were right.

What is the cost of a lollipop? She found that 81% of the children knew the price of a lollipop; in this study 67% of the Kindergarten and First Grades were right.

In Miss Gorham's study 44% knew the price of a small Hershey bar; in this study 28% were right.

What does Mother pay for butter? Miss Gorham found 5% of the children were right. In this study no child in Kindergarten or First Grade gave a reasonable answer.

What does Mother pay for eggs? Miss Gorham found no child was right. In this study the same was true,-- in the Kindergarten and First Grades no child was right.

What does Father pay for gas? Miss Gorham found 14% of the children gave a reasonable answer. In this study 1% of the children in Kindergarten and First Grade gave a reasonable answer.

What does a large bottle of milk cost? Miss Gorham found 18% of the children gave reasonable answers. In this study 7% of the Kindergarten and First Grade gave reasonable answers.

About the same number of children in both grades had bought stamps. Miss Gorham found 3% knew the cost of a stamp for a Boston letter. In this study, in the Kindergarten and First Grades 5% knew the cost of a Boston letter. Miss Gorham found no child who knew the cost of sending a letter in town. The knowledge of the cost of the daily and Sunday paper was about the same in both studies.

The recognition of coins in both studies was about the same. Most of the children knew a cent; a dime, a quarter, and a half dollar was harder. They counted the 10 cents correctly; but in both studies the children were found to have trouble in counting nickels and dimes. Less than 5% of both groups could count to 100 by 1, and counting to 100 by 10 and 5 was very bad.

Almost all of the children in both studies were found to be able to count 20 objects correctly, and to give the definite number of marbles asked for.

The children tested by Miss Gorham had a higher percent of correct answers in reading numbers than those tested in this study. Miss Gorham also showed a higher percent of children right in telling time than those in this study, although her

percent was not high. As in this study the majority of the children knew their age and a number knew their birthdays.

In both studies no child knew how tall he was, but most of the children knew where to find out. In both studies the children understood about half an apple being smaller than a whole apple. Miss Gorham said that the question of quarts and pints and inches and yards was largely a matter of guess-work, and as in this study her results indicated that the children did not understand.

Miss Gorham found 55% of the children had earned money. 31% of these could not remember how they used the money. This would seem to indicate that as in this study the children had no regular job with regular pay.

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Miss Mattie Graham also used a questionnaire similar to that used in this study. She tested children in the Kindergarten through the sixth grade. Due to the results from her questionnaire, she came to the conclusion that "The drill work in Grade II does not seem to bring big gains according to this survey." In her summary she says, "I have proved to myself beyond a doubt that a correct response in a drill example does not indicate a correct number concept. Drill in First and Second Grade does not bring number concepts. Therefore drill is less important with the young child than a concept of number or understanding of number in his own experience. We take many experiences for granted. Problems about prices and how we buy and sell mean little below the Third Grade."

Miss Elizabeth Quattlander reported on an informational unit which she worked out in Second Grade. The children kept expense books using as a basis their own allowance and any other money received by them. Miss Quattlander says that "The children were keenly interested---many wished to continue (by themselves) through the summer....It was a real situation--the children used their own money...saving and spending as they chose...the results were satisfactory...it met a real life situation in numbers to be learned...When number facts were later presented, they were not new and were learned easier.....The children often used their book number facts not yet taught." In her conclusion, she says "The time spent this year on informational units was the most happily spent time in all the allotted arithmetic plan. This way of preparing for later use of number knowledge is a satisfactory method with small children."

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Miss Emma F. Harris gave, as before stated, a questionnaire similar to this one. The children tested ranged from the Kindergarten through the Ninth Grade. The ages ranged from 4 years through 17 years. In the Kindergarten and first three grades, the results were similar to those found here. The results of her questionnaire led her to these conclusions:-

"1. Experiences are governed by locality usages.

2. Problems should be based on experiences prevalent in the locality."

The studies of Helen Gorham, Mattie Graham, Elizabeth Quattlander and Emma Harris have already been discussed.

VI.-Significance of the Percentage Difference.[1]

In the discussion of tables in this study, comparisons have been made and differences brought out. In order to know whether or not these differences are of significance, it will be necessary to apply the formula[2] used to determine the statistical significance of these differences. A typical case to illustrate this will be given in this section. Room 3 had formal arithmetic; Room 4 had informal arithmetic. In Table VII, page 51, these two Rooms are compared as to the results obtained in Question 8 on counting money.

Holzinger gives the following equation for the probable error of a percentage frequency.[2] $PE_{fp} = .6745\sqrt{\frac{fp(100-fp)}{N}}$

fp is the precentage score or frequency and N is the number of children. Applying this equation to a typical case in Table VII page 51, under 8b - Total - Room 3 - 64% we have

$$PE_{64} = .6745\sqrt{\frac{64\ (100-64)}{12}} = \pm 9.35$$

Therefore this particular 64 may be thought of as ± 9.35.

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[1] 1.-Wilson, Dorothy - What Measures Do People Know and Why? Master's Thesis- Boston University - 1936 p. 22

[2] 2.- Holzinger, Karl J.- Statistical Methods for Students of Education - Ginn and Co.- 1928 - pp. 243-244

Again applying the formula, taking from Table XII, page 51, under 8b- Total - 75%, we have $PE_{75} = .6745\sqrt{\frac{75(100-75)}{12}}$ $= \pm 8.44$. Therefore this particular 75 may be thought of as ± 8.44.

As Room 3 and Room 4 are being compared, the difference between the percents of the two rooms is of interest.

If 64% of the children in Room 3 answered correctly, and 75% of the children in Room 4 answered correctly, then 11% more of the children in Room 4 (the informal Room) answered correctly than in Room 3 (the formal Room). Just what statistical value does this 11% difference have? Again Holzinger gives a formula for the significance of the percentage difference as follows:-

$$PE_{(diff.)} = \sqrt{(PE \text{ of 1st percent})^2 + (PE \text{ of 2nd percent})^2}$$

Applying this formula to the probable errors as figured above we have $PE_{(diff.)} = \sqrt{(9.25)^2 + (8.44)^2} = \pm 12.55$. Therefore the percent difference between the two Rooms, (75% - 64% = 11%) 11% equals ± 12.55

Since the actual difference (11%) is not five times the probable error of the difference (12.55) the difference between the two Rooms statistically speaking is not significant.

These formulas might be applied in all cases where comparisons are made or differences discussed, either in this study itself or in comparing this study with other studies. But this seems hardly necessary, considering the labor involved. The small number of children participating in the testing causes the probable error (PE) to increase and the differences are not

likely to show special significance.

Dorothy Yarbrough[1] and Gertrude Hanley[2] used these formulas in discussing gains in arithmetic made by the children; Dorothy Wilson, before referred to, in discussing measures people know, not only as individuals but in sections of the country.

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1. Yarbrough, Dorothy - A Diagnosis of Pupils' Errors in
Arithmetic with a View to Corrective Work Carried
On Through the Cooperation of Teachers.
Master's Thesis - 1938 - Pages 80-83

2.-Hanley, Gertrude F. - Corrective Load in the Fundamentals of
Arithmetic, Grades 4, 5, and 6.- Chapter on
Significance of Percentage Differences.
Master's Thesis - 1938 Pages

VI. Summary and Conclusions.

From the data collected, it would appear that few children know the cost of common commodities. The cost of food or how much is purchased means very little to them. A big bottle of milk is just a big bottle of milk. Quart is not applied to the quantity of milk in the bottle. The cost of mailing a letter in town or to a place outside showed little knowledge of the Post Office. The newspaper was purchased, but the price paid rarely realized.

The children did recognize most of the coins; but it was not until the Third Grade that all the class knew how much 5 nickels were; and even the Third Graders were not at all sure of how much money 10 dimes made. Coins in relation to each other were not well understood even by the Third Grade. Counting to 100 by 1 was easy above the First Grade, but by 10's and 5's not so easy. The counting of objects seemed to be well understood even by the Kindergarten. Reading of numbers was very poor, and the numbers seen were for the most part in school situations.

Over 60% of all the children knew how to find out the day. Finding the day was rather difficult for the Kindergarten and First Grade. Above the First Grade a little more than 70% of the children found the day on the calendar correctly.

Although the majority of the children could tell where to get the time, even the Third Grade had trouble in reading time from the clock.

Almost all of the children knew how old they were and the age of brothers, sisters, or friends. The Kindergarten and First

Grade children did not know their birthday dates, but above the First Grade most of the children knew at least the month.

Few of the children knew how tall they were, but they did know how to find out.

The majority of the children knew that a whole apple was larger than half an apple; and above the First Grade that a half was larger than a quarter. As previously stated, the word yard was misunderstood in the First Grade and Kindergarten. Inch and yard, pint and quart were well understood above the First Grade, and the majority of the children knew which was larger.

Almost all of the children knew that there were two pieces when an apple was cut in half, and above the First Grade the majority of the children knew there were four pieces when an apple was cut in quarters.

Where the children did work, the amount of money did not mean much in relation to the job.

Russell said, in his conclusion, "It is not likely---- that the First Grade or Second Grade pupil will be mature enough to master completely and understand isolated addition or subtraction facts. Formal work such as drill over these Arithmetic facts should be discouraged. The observation indicates that the initial training in Arithmetic should be undertaken with the use of concrete materials."[1]

The results of the present study are supported by results

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[1] Russell, Ned - Arithmetical Concepts of Children - Journal of Education - May, 1936 - page 663.

obtained in the previous studies before mentioned of Harris, White, Graham, and Gorham. Among the conclusions that seem justified are the following:-

1- That although children are interested in going to the store, yet they seldom have an idea of the cost of the articles purchased even in the Third Grade.

2- It is seen by the answers to the Question on the cost of mailing a letter, that even when the Post Office has been studied as a unit in Grade II, the results are little better than when the children have not made a study. The unit evidently came too early in school life.

"It is very unpleasant being taught anything that you feel is beyond your understanding---an important maxim is not to strike before the iron is hot, as an irreparable damage may thus be done."[1]

3- That children recognize coins but that the value of coins in relation to other coins is vague.

4- That counting to 100 by 1 seemed to be perfected above the First Grade. The Kindergarten counted objects successfully.

5- That the children understood the use of the calendar and the clock even if they were unable to use either.

6- Ages and birthdays seemed to be very interesting to the children from the Kindergarten up.

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[1] Drummond, Margaret - The Psychology and Teaching of Number- 1925 - Page 23 of the Introduction.

7- The children use half of something often, and a quarter sometimes. But quart, inch, and yard do not seem to come within their experience.

8- The children were not given a job for which they were responsible or for which they were paid according to value received.

In order to determine the units or simple situations for teaching Arithmetic, it must first be determined just what Arithmetic the children know. A few units and simple situations are suggested for use in the Kindergarten, First, Second, and Third Grades, based upon this study.

"The modern First Grade teacher provides very definitely for instruction in Arithmetic, but she makes that instruction a series of interesting and delightful experiences."[1]

Again we find- "In the classroom--education starts with an interest which absorbs the pupils and expands and deepens that interest into a series of related and worthwhile experiences."[2]

The Kindergarten, First Grade, and Second Grade should build up number experiences and number vocabulary. "The early number experiences of children seem to be a more or less confused mass of ideas and feelings about objects and activities;

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[1] Morton, R. L. - Teaching Arithmetic in the Primary Grades- Silver, Burdett & Co., 1927 - page 16

[2] National Council of Teachers of Mathematics- Tenth Year Book page 86.

but as one situation after another is singled out of this 'big, buzzing confusion', and given meaning and significance, the child's number precepts are clarified and enlarged---Thus there is built up a large body of mathematical experiences that form a background and give a basis for the later and more formal study of number."[1]

The Kindergarten teacher is alert to all number situations,-an extra bottle of milk--not chairs enough--a late child--talks on number--how many in the family--one mitten lost, or both mittens lost--measuring for height--weighing--comparing sizes, etc. We found that Kindergarten children count. There are many things to count--children present, children absent, chairs, milk bottles, crackers,--all situations that arise naturally. The picture on the next page--after breakfast--before dinner--having a pin-wheel sale, only pennies and nickels used--counting own or milk money--counting bank money; the arithmetic connected in building with blocks or making things with boards , hammer, and nails.

"Only as the units of work or activities in which the children engage are selected in terms of a total social experience today is there any assurance that the school can meet its obligations to society and the individual."[2]

1- McLaughlin and Trozell- Number Projects for Beginners- in Preface - page VI

2- National Council of Teachers of Mathematics-Tenth Year Book- Page 120.

In the kindergarten the teacher and class recognize a birthday and the age of the child.

The First Graders are still greatly interested in their birthdays. A birthday calendar which gives not only birthdays but leads to interest in the present month and day as well as the reading of numbers, etc., is suggested. This may lead to a weather calendar in the Second Grade.

Building with blocks, making a road or tunnelling in the sand, sawing or nailing boards for a chair or doll bed, several painting, brushes for some, how much or how long to paint so that others may share in the job, a toy store with nothing over 10¢, sewing for the house, as curtains, chair cushions, a pieced bed coverall need measuring. The First Grade is much interested in measuring, not down to the ruler inch, but all legs of the doll's bed must be even; the cushion must fit the chair, the quilt the bed. A unit of home-making and the family offer many number situations.

The Second Grade are more interested in their height and weight. Who weighs the most is a big question. The children are ready to compare size, age, desks, anything and everything . A roadside stand was used with great success in one Second Grade. This unit grew out of another on sources of food, and the farmer. Miss Olive Mahoney carried on units with a toy shop and a drug store in a First Grade with great success.[1]

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[1] Mahoney, Olive- Extending First Grade Experiences in Number. Unpublished Thesis at Boston University - 1938.

All the children knew that time was told by the clock. They ask even in Kindergarten--Is it time for lunch, is it time to go home? The First Grade often ask--Have we had dinner yet? Or, as one child asked, Is this today or tomorrow? Is it time to read--is it time to play--will I have time to do my writing? The answer to these questions and by telling when the big hand is up on 12 we will go home or we will eat our lunch, make a foundation for a real time unit in Third Grade which this study showed that the Third Grade were ready for. Second Grade use money as cents, nickels, dimes, and quarters. The children may have a May-basket sale, or a pin-wheel sale.

The Third Graders are ready for games in teams with scorers, a store, expense accounts, etc.

There is no special Grade for any unit as this study shows it depends on the experiences of the children, not the Grade.

"All these experiences have come through the play-way, through the arising of needs demanding satisfaction or problems necessitating a solution. It will be noticed, too, that the driving power which enables the children to undertake what might be considered arduous tasks is interest."

"When the child has the purpose to achieve, those learnings which might otherwise involve difficult obstacles are with amazing agility mastered as necessary skills, achievements. And, in those experiences where readiness attends the act, the learn-

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1- McLaughlin and Troxell- Number Projects for Beginners - page 8

ings are freer to become a part of the next learning situation, to function when and where needed."[1]

"By teaching Arithmetic in this way ample provision is made for pupils' self-activity and initiative. The work is thoroughly motivated and hence will be more interesting from the very beginning. Pupils see the need for each process and idea, and learn the required facts through use. The result is a longer retention of the useful knowledge gained, and a greater possibility of the skill and knowledge gained transferring to actual life situations and needs in later years."[2]

Wilson suggests no formal Arithmetic until the Third Grade.[3] The Massachusetts State Course of Study has no requirements before Third Grade.[4] It also suggests units and situations for use in Arithmetic. [illegible], and [illegible] come to the same conclusion, as previously stated.

"All processes will thus be taught at a time when real need for the knowledge is felt by the child."[5]

1- National Council of Teachers of Mathematics- Tenth Year Book- page 60

2- Newcomb, Ralph S.- Modern Methods of Teaching Arithmetic- Page 106

3- Wilson, Guy - What Arithmetic Shall One Teach?

4- The Commonwealth of Massachusetts - Department of Education- Massachusetts State Course of Study

5- Newcomb, Ralph S. - Modern Methods of Teaching Arithmetic page 106.

Russell did not think that First or Second Grade children were "mature enough to have formal work with Arithmetic facts."[1]

The teachers must be sure that the number unit or situation comes within the experience of the child, and then, by building on and broadening his experiences, give him new ones.

"The teacher's aim should be to aid the normal development of children through enrichment of experience.---The teacher must learn to live and play and plan with the children on their level---The teacher must learn to stand by, to wait, to recognize pupil leads and encourage them."[2]

Number "comes with the normal development resulting from experience."[2]

1- Russell, Ned M.- Arithmetical Concepts of Children - Journal of Educational Research - Vol. [illegible]- No. [illegible] - May, 1936 - pages [illegible].

2- Wilson, Stone, Dalrymple - Teaching the New Arithmetic - McGraw-Hill, [illegible] - pages 30,31.

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